

Wildfire – A large part of Coconino County is characterized by the Arizona Mountain Forest ecoregion, with its large areas of dense pine forests (see Figure 1-3). This region presents the greatest wildfire hazard in the county. Vegetation in other areas of the county is relatively sparse and does not pose much of a threat.

The Greater Flagstaff Area Community Wildfire Protection Plan¹⁹ (GFACWPP), Greater Williams Area Community Wildfire Protection Plan²⁰ (GWACWPP), and Tusayan Community Wildfire Protection Plan²¹ (TCWPP) are three community wildfire protection plans that cover various urbanized areas of Coconino County. The Greater Flagstaff Forests Partnership (GFFP) and Ponderosa Fire Advisory Council (PFAC) combined forces to prepare the GFACWPP, and it is the largest planning area of the three plans, covering a significant portion of the forested areas within the vicinity of Flagstaff and Sedona. Figure 4-2 is an excerpt from each of the community wildfire protection plans showing the limits of the study area and the extent of communities identified to be within wildland/urban interface areas.

Three factors influence the spread of wildfire; fuel, weather, and topography. Only fuel can be managed to reduce the intensity and spread of wildfire. The mountainous regions of Coconino County offer significant sources of fuel and topography favorable to wildfire. The intersection of environmental and economic sectors versus historically natural fire patterns and seasons, has left much of the forested areas in a prime condition to experience extremely destructive fires. In addition, overlap hazards such as bark beetle infestations and extended severe drought conditions only exasperate the wildfire hazard. Figure 4-3 shows maps from the GFACWPP and GWACWPP presenting vegetation types within the study limits of those plans. There was no map available in the TCWPP for display.

¹⁹ GFFP and PFAC, 2004, *Greater Flagstaff Area Community Wildfire Protection Plan*

²⁰ Kleindienst, George, 2005, *Draft Greater Williams Area Community Wildfire Protection Plan*

²¹ Tusayan Community Wildfire Protection Committee, 2005, *Tusayan Community Wildfire Protection Plan*

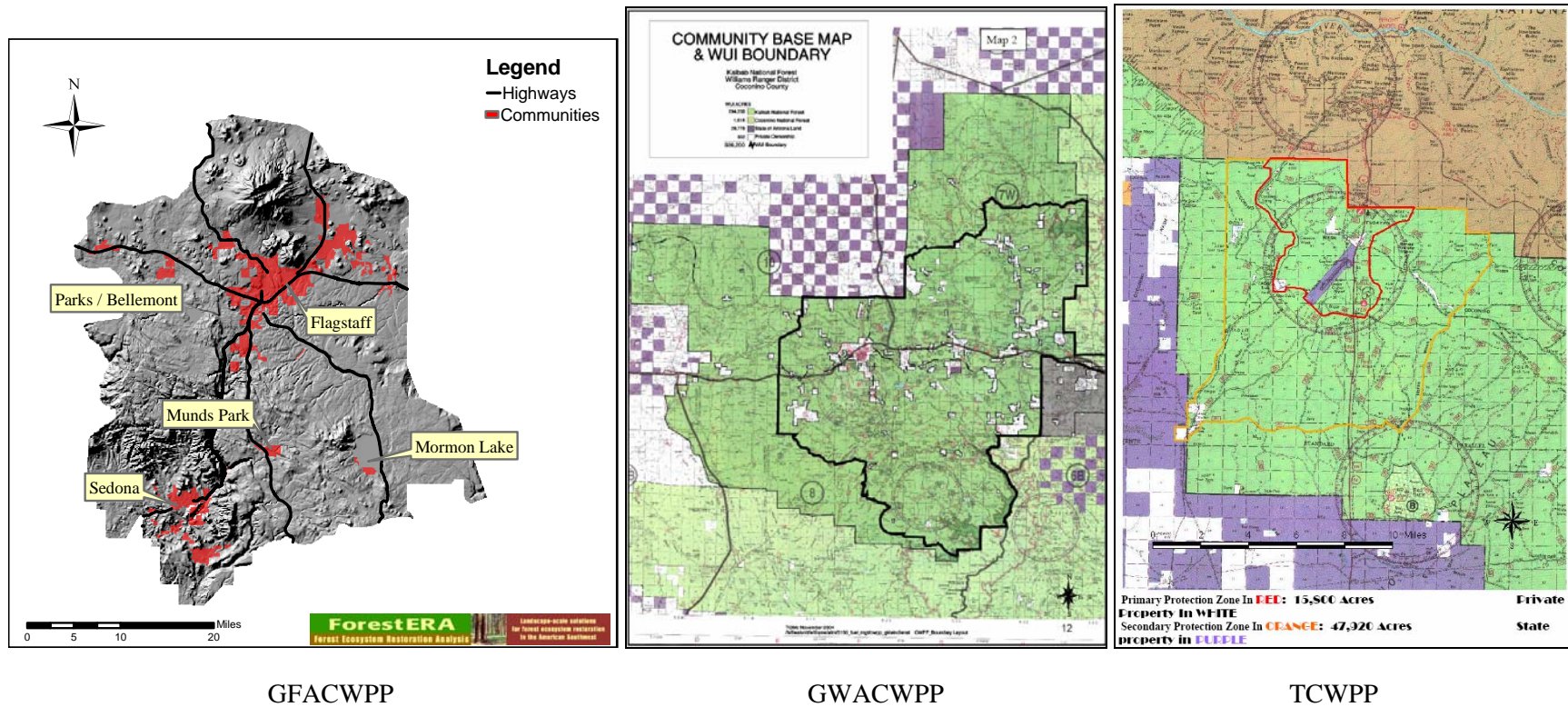
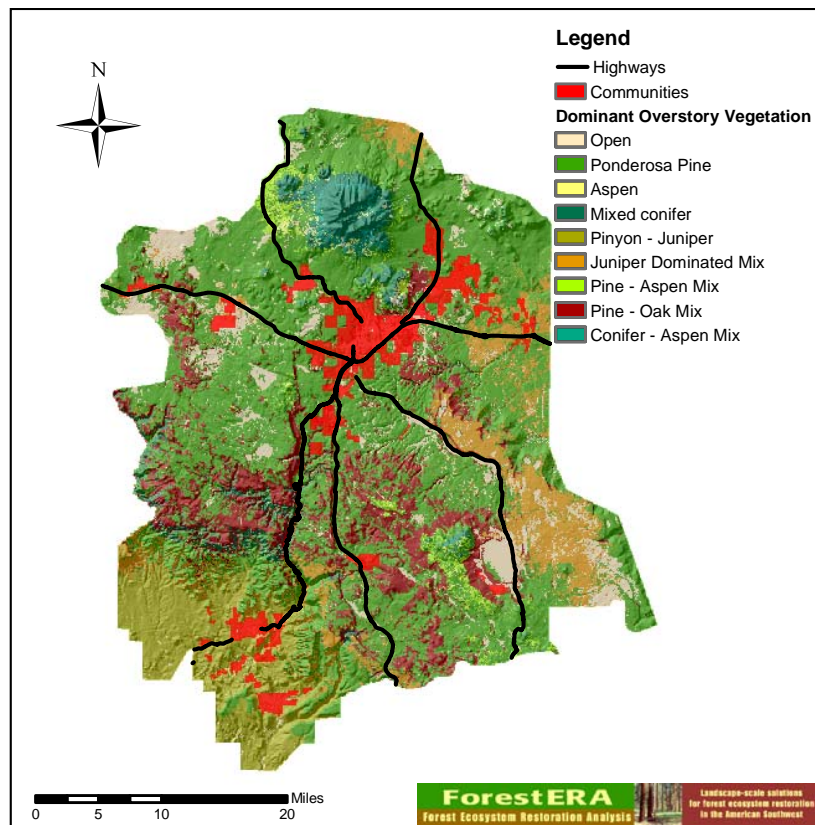
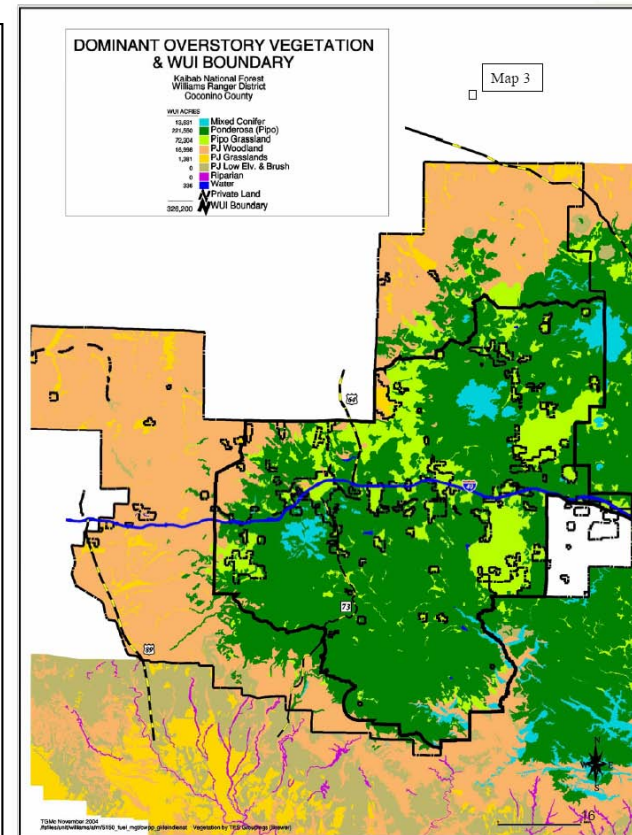


Figure 4-2
Limits of Various Community Wildfire Protection Plan Study Areas



GFACWPP



GWACWPP

(No TCWPP Map available)

Figure 4-3

Dominant Vegetation Types within the Various Community Wildfire Protection Plan Study Areas

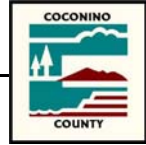
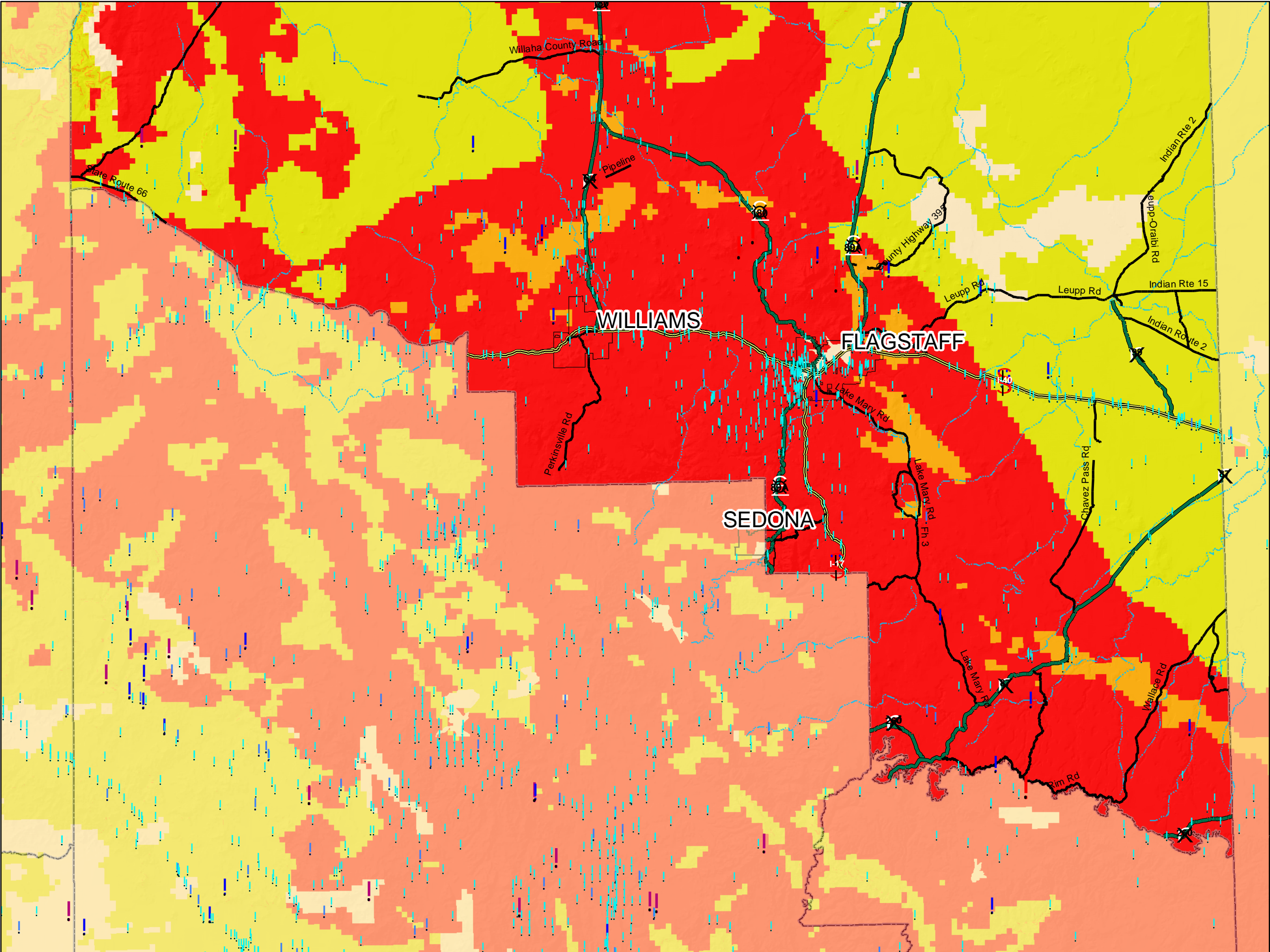



Figure 4-4 presents a map of Coconino County depicting various wildfire hazard areas that range from extreme to low. Also depicted on Figure 4-4 are historic fire locations and sizes. The map is based on the data prepared and presented in the State Plan, with slight modifications made by the Coconino County MJPT to correct anomalies in the delineations and provide closer correlation to the CWPP in some locations.

Winter Storms – Winter snows are the lifeblood of water supplies for most of Coconino County. However, according to the database summarized in Table 4-3, winter storms are second most costly and deadly natural hazard to impact Coconino County. Severe winter storms affect many aspects of life in the county including; transportation, emergency services, utilities, agriculture and the supply of basic subsistence to isolated communities. Interstates 40 and 17 have produced numerous fatal multi-car accidents due to heavy winter snowfall and icy road conditions. Heavy snowfalls can also leave motorists stranded in their vehicles with potentially disastrous results like hypothermia and carbon-monoxide poisoning. Significant snowstorms can also hinder both ground and air emergency services vehicles from responding to accidents or other emergencies. Remote areas and communities can be easily cut-off from basic resources such as food, water, electricity, and fuel for extended periods during a heavy storm. Extremely heavy snowstorms can produce excessive snowloads that can cause structural damage to under-designed buildings. Agricultural livestock can also be vulnerable to exposure and starvation during heavy snowstorms. The following are highlights of the more prominent flooding events impacting Coconino County:

- In December of 1967 to January of 1968, the worst winter storm to impact Coconino County occurred paralyzing most of northern Arizona and bringing snow to much of the state. The storm was actually two storms, with the second following closely on the heels of the first. During the nine day period, 86.0 inches of snow fell at Flagstaff. On December 14, a one-day state record of 38.0 inches fell at the Heber Ranger Station with reported totals of 91.5 inches at the Heber Ranger Station, 32.5 inches at Sedona, and 31.0 inches at the South Rim of the Grand Canyon. The Navajo Nation was extremely hard hit as two to three feet of snow fell across the community. Window Rock measured 33.5 inches. People on the reservation were instructed to use ashes from their stoves to write distress signals in the snow that could be spotted from the air. Heavy snows isolated Page and other Northern Arizona communities for approximately two weeks. Most roads were closed and emergency food had to be airlifted into the communities. The total disaster cost to the State of Arizona was \$2.2 million in 1997 dollars. A total of eight people died of exposure. (ADEM, 2004)



COCONINO
COUNTY



MULTI-HAZARD
MITIGATION PLAN

Legend

Interstates

US, State, County Hwys

Major Arterials

Major Watercourses

Fire Hazard

Low

Medium

High

Extreme

Historic Fires

Less than 10 acres

10 - 100 acres

100 - 500 acres

500 - 5000 acres

Greater than 5000 acres

0

5

10

20

Miles

Sources:

Arizona Land Resource Information System, August 2003

Arizona Department of Emergency Management, 2003

URS, October 2003

Visual Risk, 2003

Coconino County, 2004

City of Flagstaff, 2004

Sedona Fire District, 2004

Sheet 2


COCONINO
COUNTY

Sheet 1

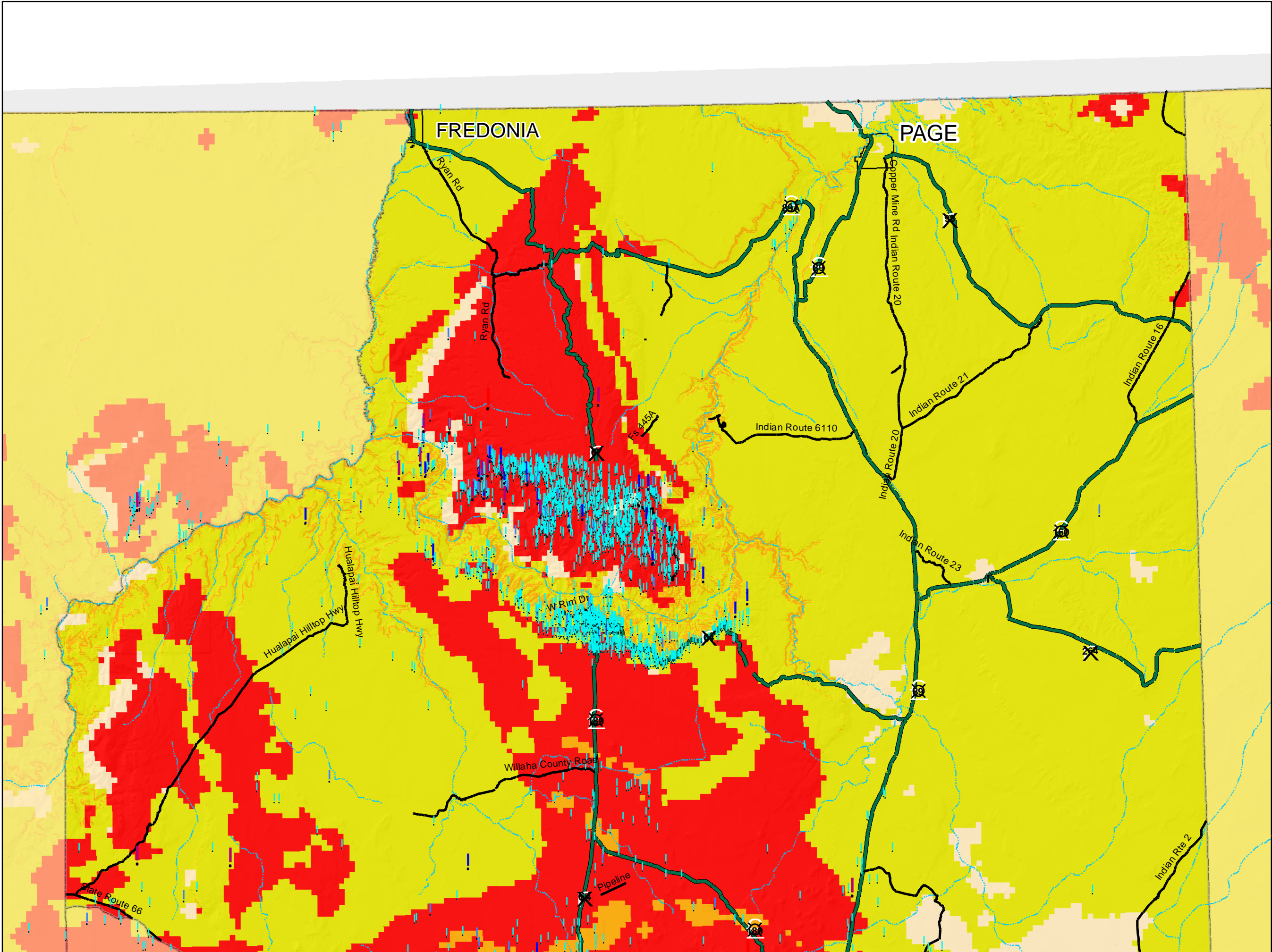
Key Plan

Figure 4-4; Sheet 1 of 2


Wildfire Hazard Map
for Coconino County



JE FULLER
HYDROLOGIST & GEOMORPHOLOGIST, LLC



COCONINO
COUNTY



MULTI-HAZARD
MITIGATION PLAN

Legend

Interstates

US, State, County Hwys

Major Arterials

Major Watercourses

Fire Hazard

Low

Medium

High

Extreme

Historic Fires

Less than 10 acres

10 - 100 acres

100 - 500 acres

500 - 5000 acres

Greater than 5000 acres

01020

Miles

Sources:

Arizona Land Resource Information System, August 2003

Arizona Department of Emergency Management, 2003

URS, October 2003

Visual Risk, 2003

Coconino County, 2004

City of Flagstaff, 2004

Sedona Fire District, 2004

Sheet 2


COCONINO
COUNTY

Sheet 1

Key Plan

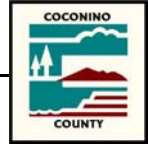
Figure 4-4; Sheet 2 of 2

Wildfire Hazard Map
for Coconino County



IE FULLER

HYDROLOGIST & GEOMORPHOLOGIST, LLC



- In January of 1995, heavy snows and wind downed powerlines and caused a 60 foot tree to fall on a mobile home in the Flagstaff area. Storm related damages were estimated at over \$50,000. (NCDC, 2003)
- In January of 1997, a heavy winter storm moved through the northern part of the state dropping 34 inches of snow on the Flagstaff area and forcing the closure of Interstates 17 and 40. The total disaster cost to the State of Arizona was \$1.6 million in 1997 dollar. (ADEM, 2004)

The National Climatic Data Center²² has compiled snow climatology statistics for Arizona using historic record data from statewide National Weather Service cooperative observer site for the period of 1948 to 1996²³. The NCDC used these data sets to develop 1-, 2-, and 3-day, 10-, 25-, 50-, and 100-year recurrence interval statistics for each of the statistically eligible²⁴ stations. Each station in Arizona and the nearest stations in the surrounding states of California, Nevada, Utah, Colorado, and New Mexico were queried from this data set to establish maps showing statistical projections of the 1- and 3-day, 10- and 100-year snow depths. For each recurrence interval, simplified isohyets of snow depth were developed using standard contouring methodology and consideration of geographic features such as mountain peaks, the Mogollon Rim, etc. The resultant maps can then be used to conceptually estimate potential snow depths for each of the recurrence intervals at any given location within the state. Figures 4-5, 4-6, 4-7, and 4-8 present the results for the 1-day, 10-year; 1-day, 100-year; 3-day, 10-year; and 3-day, 100-year events. It is duly noted that the results provided on these maps are for the benefit of hazard mitigation planning only and should not be used for design purposes.

Transportation Accident – Coconino County is home to several major transportation elements. Interstate 40 is a major trucking route that nearly spans the entire U.S. from east to west. Interstate 17 connects Interstates 40 and 10 and is the primary truck route south into Phoenix. U.S. Highways 89 and 89A are the primary connectors between Sedona, Flagstaff, and Page. U.S. Highway 180 and State Route 64 serve provide access to the south rim of the Grand Canyon and U.S. Highway 160 serves as the primary artery across

²² The NCDC is a part of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

²³ NOAA/National Climatic Data Center, 1998, *United States Snow Climatology*, TD-9641

²⁴ Those stations with sufficient continuous data.

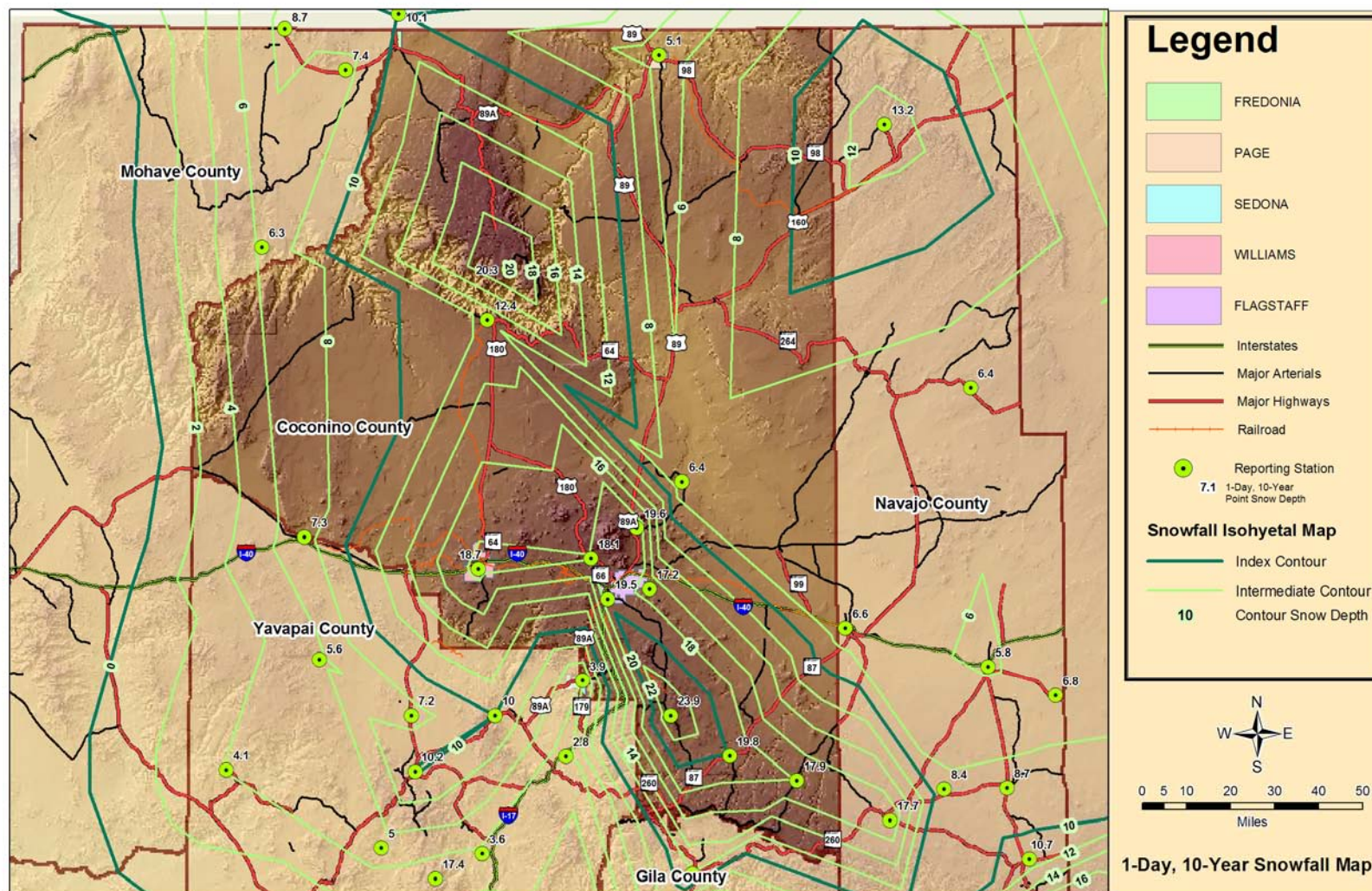
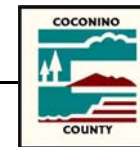


Figure 4-5
1-Day, 10-Year Snow Depth Map for Coconino County

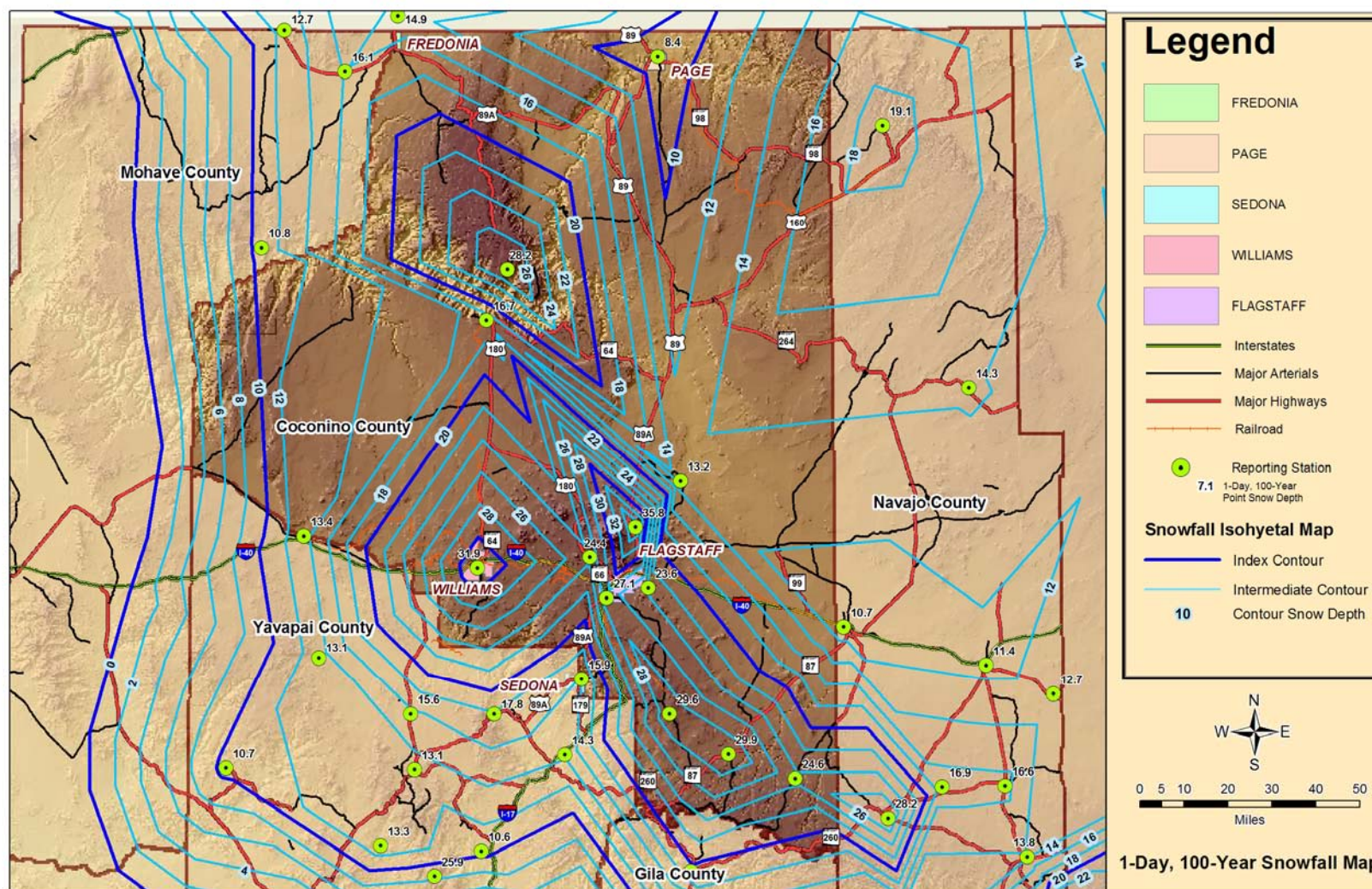
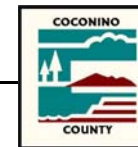


Figure 4-6
1-Day, 100-Year Snow Depth Map for Coconino County

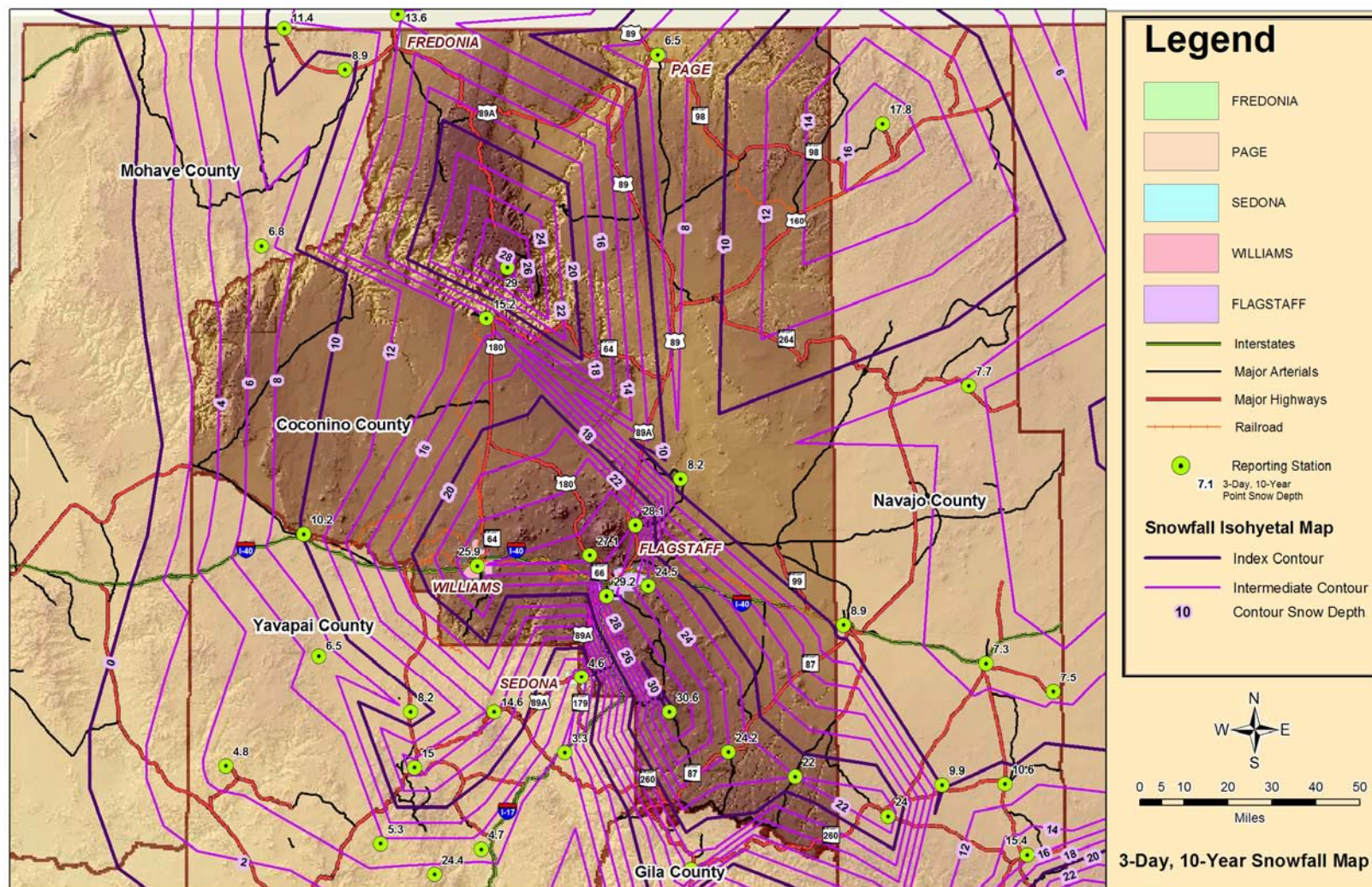
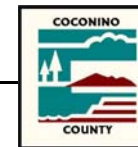


Figure 4-7
3-Day, 10-Year Snow Depth Map for Coconino County

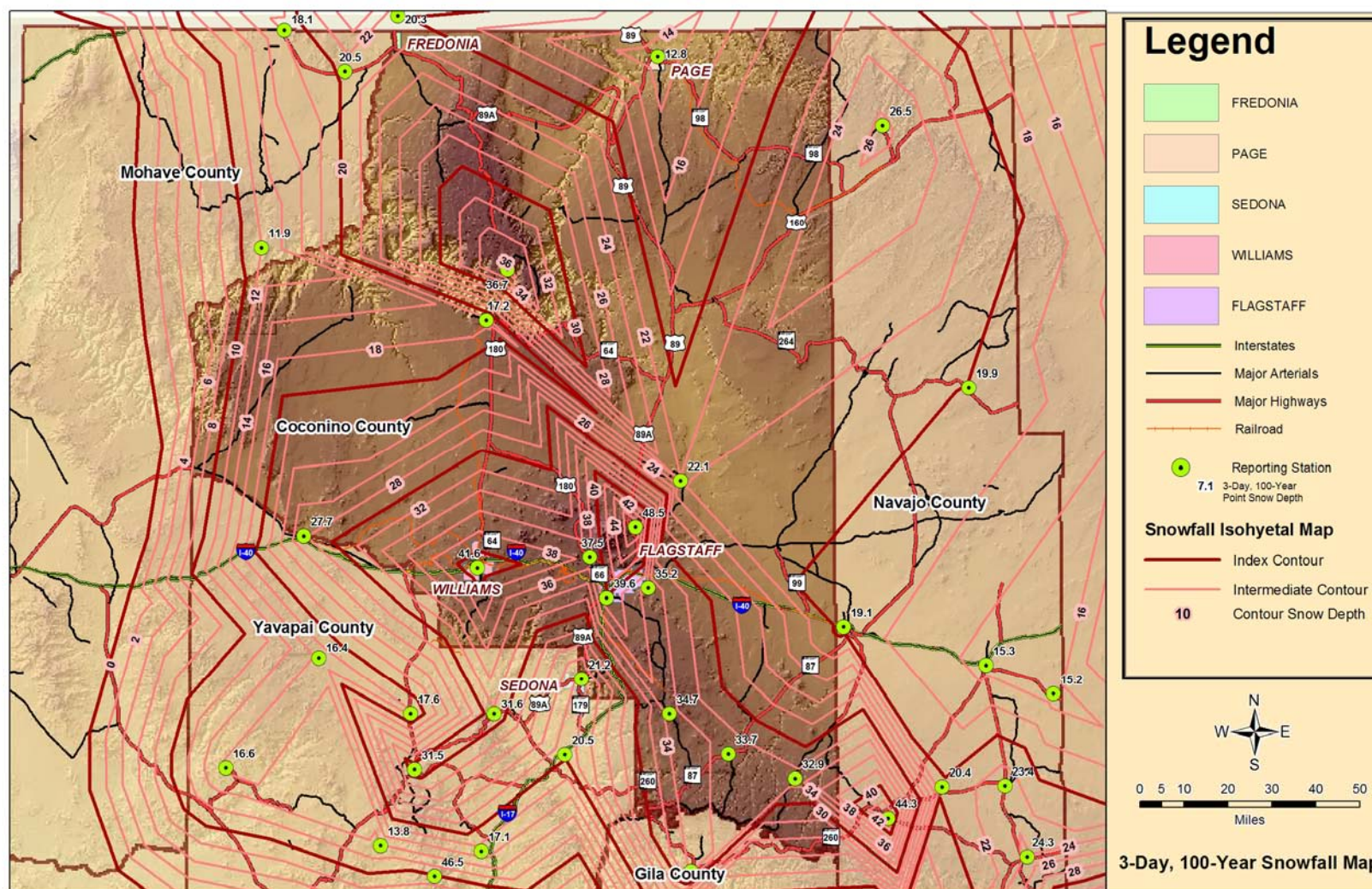
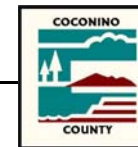


Figure 4-8
3-Day, 100-Year Snow Depth Map for Coconino County



the Navajo and Hopi Nations to the Four Corners area. There are also hundreds of miles of other state and county roadways that comprise the county's transportation infrastructure. The Burlington-Northern Santa Fe (BNSF) Railway extends east-west through the southern portion of the county and passes directly through the hearts of Flagstaff and Williams. AMTRAK also operates on the BNSF lines and maintains passenger depots in Flagstaff and Williams. The City of Flagstaff operates Flagstaff-Pulliam Airport, which is the largest commercial airport in the county. Other commercial airports are located in Grand Canyon National Park and Page. Smaller, public-use airports are located in Tuba City, Williams, and Valle, and there are several other private airstrips scattered across the county. The combined impact of all the air, roadway, and railway traffic presents an appreciable hazard potential to the urbanized areas of the county. Major transportation routes for other parts of the County are shown on Figure 1-2.

In the past, Coconino County residents have been exposed to several train derailments, train/vehicle and train/pedestrian accidents, multiple car accidents due to winter storms and icy roadways, and airplane crashes. In most cases, the actual property damages at an incident level are limited to the vehicles involved. The greatest losses are manifested in fatalities and injuries. Associated consequences may include hazardous material releases, emergency response capacity limitations, freeway/highway closures, and wildfire ignition. Given the size of the county, many of the rural and isolated portions of these transportation corridors are difficult to provide emergency services to and can often severely tax a community's emergency operational budget and capacity.

4.2.3 Hazard CPRI Ranking

Within the Arizona Hazard Mitigation Planning System (AzHMPS), the state has incorporated a tool (CPRI) by which individual hazards can be evaluated and even ranked according to an indexing system. The CPRI value is obtained by assigning varying degrees of risk to four (4) categories for each hazard, and then calculating an index value based on a weighting scheme per Table 4-4 ²⁵. Table 4-5 summarizes the CPRI element assignments and resulting value for each hazard summarized in Table 4-2, with the MJPT top ranked hazards indicated by *italicized bold* text.

²⁵ Table 4.3 from the AzMLHMP

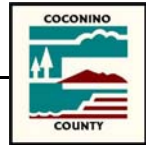


Table 4-4

Summary of Calculated Priority Risk Index (CPRI) categories and risk levels

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	<ul style="list-style-type: none"> Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001. 	1	45%
	Possibly	<ul style="list-style-type: none"> Rare occurrences with at least one documented or anecdotal historic event. Annual probability that is between 0.01 and 0.001. 	2	
	Likely	<ul style="list-style-type: none"> Occasional occurrences with at least two or more documented historic events. Annual probability that is between 0.1 and 0.01. 	3	
	Highly Likely	<ul style="list-style-type: none"> Frequent events with a well documented history of occurrence. Annual probability that is greater than 0.1. 	4	
Magnitude/ Severity	Negligible	<ul style="list-style-type: none"> Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). Injuries or illnesses are treatable with first aid and there are no deaths. Negligible quality of life lost. Shut down of critical facilities for less than 24 hours. 	1	30%
	Limited	<ul style="list-style-type: none"> Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability and there are no deaths. Moderate quality of life lost. Shut down of critical facilities for more than 1 day and less than 1 week. 	2	
	Critical	<ul style="list-style-type: none"> Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and at least one death. Shut down of critical facilities for more than 1 week and less than 1 month. 	3	
	Catastrophic	<ul style="list-style-type: none"> Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and multiple deaths. Shut down of critical facilities for more than 1 month. 	4	
Warning Time	Less than 6 hours	Self explanatory.	4	15%
	6 to 12 hours	Self explanatory.	3	
	12 to 24 hours	Self explanatory.	2	
	More than 24 hours	Self explanatory.	1	
Duration	Less than 6 hours	Self explanatory.	1	10%
	Less than 24 hours	Self explanatory.	2	
	Less than one week	Self explanatory.	3	
	More than one week	Self explanatory.	4	

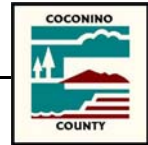
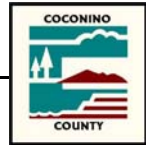


Table 4-5
Summary of CPRI values for each hazard

Hazard	Probability	Magnitude Severity	Warning Time	Duration	CPRI
Natural Hazards					
Avalanche	Possible	Limited	Less than 6 hours	Less than 6 hours	2.20
<i>Drought</i>	<i>Likely</i>	<i>Limited</i>	<i>24+ Hours</i>	<i>More than one week</i>	<i>2.50</i>
Dust/Sand Storms	Possible	Limited	Less than 6 hours	Less than 6 hours	2.20
Earthquake	Possible	Critical	Less than 6 hours	Less than 6 hours	2.50
Extreme Cold	Likely	Limited	6-12 Hours	Less than one week	2.70
Extreme Heat	Likely	Limited	24+ Hours	Less than one week	2.40
<i>Flooding/Flash Flood</i>	<i>Likely</i>	<i>Limited</i>	<i>Less than 6 hours</i>	<i>Less than one day</i>	<i>2.75</i>
Infestations	Possible	Limited	Less than 6 hours	More than one week	2.50
Landslides/Mudslides	Possible	Limited	Less than 6 hours	Less than 6 hours	2.20
Thunderstorms/ High Winds	Likely	Limited	Less than 6 hours	Less than 6 hours	2.65
Tornadoes/Dust Devil	Possible	Limited	Less than 6 hours	Less than 6 hours	2.20
<i>Tropical Storms/Hurricanes</i>	<i>Likely</i>	<i>Limited</i>	<i>6-12 Hours</i>	<i>Less than one day</i>	<i>2.60</i>
<i>Wildfires</i>	<i>Likely</i>	<i>Critical</i>	<i>Less than 6 hours</i>	<i>More than one week</i>	<i>3.25</i>
<i>Winter Storms</i>	<i>Likely</i>	<i>Limited</i>	<i>12-24 Hours</i>	<i>Less than one week</i>	<i>2.55</i>
Human-Caused Hazards					
Biological Hazards	Possible	Limited	Less than 6 hours	More than one week	2.50
Dam/Levee Failure	Possible	Critical	6-12 Hours	Less than one day	2.45
Explosion/Fire	Possible	Limited	Less than 6 hours	Less than one day	2.30
Fuel/Resources Shortage	Possible	Limited	24+ Hours	More than one week	2.05
Hazardous Materials Incidents	Possible	Limited	Less than 6 hours	Less than one week	2.40
Power/Utility Failure	Possible	Limited	Less than 6 hours	More than one week	2.50
Terrorism	Possible	Limited	Less than 6 hours	Less than one week	2.40
<i>Transportation Accident</i>	<i>Likely</i>	<i>Limited</i>	<i>Less than 6 hours</i>	<i>Less than one day</i>	<i>2.75</i>



4.3 Vulnerability Assessment

The vulnerability assessment builds upon the previously developed hazard information by identifying the community assets and development trends and intersecting them with the hazard profiles to assess the potential amount of damage that could be caused by each hazard event. This concept is generally illustrated by Figure 4-9.

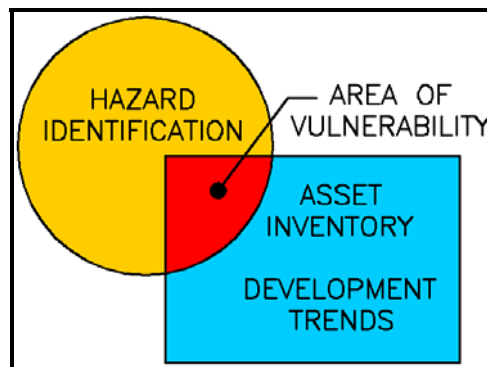


Figure 4-9

Conceptual depiction of a vulnerability analysis

For the Coconino County Multi-Hazard Mitigation Plan, the following tasks were performed as a part of the vulnerability assessment:

- ☒ **Assets Inventory**
- ☒ **Potential Loss Estimations**
- ☒ **Development Trends Analysis**

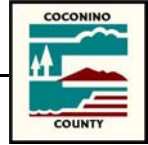
The following sections summarize the MJPT efforts to assemble and analyze the data needed for the vulnerability assessment, and present the results.



DMA2K Citation

Requirement §201.6(c)(2)(ii):

[The risk assessment shall include:...] (ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.



4.3.1 Asset Inventory

The State of Arizona Hazard Mitigation Plan defines assets as:

Any natural or human-caused feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.



DMA2K Citation

Requirement §201.6(c)(2)(ii)(A):

The plan should describe vulnerability in terms of: (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

Assets identified by the MJPT for Coconino County and the incorporated communities are classified as either critical or non-critical facilities and infrastructure. Critical facilities and infrastructure are those systems within the county whose incapacity or destruction would have a debilitating impact on the county's ability to recover following a major disaster, or to defend the people and structures of the county from further hazards. Following the criteria set forth by the Critical Infrastructure Assurance Office (CIAO), the State of Arizona has adopted eight general categories²⁶ that define critical facilities and infrastructure:

1. **Telecommunications Infrastructure:** Telephone, data services, and Internet communications, which have become essential to continuity of business, industry, government, and military operations.
2. **Electrical Power Systems:** Generation stations and transmission and distribution networks that create and supply electricity to end-users.
3. **Gas and Oil Facilities:** Production and holding facilities for natural gas, crude and refined petroleum, and petroleum-derived fuels, as well as the refining and processing facilities for these fuels.
4. **Banking and Finance Institutions:** Banks, financial service companies, payment systems, investment companies, and securities/commodities exchanges.
5. **Transportation Networks:** Highways, railroads, ports and inland waterways, pipelines, and airports and airways that facilitate the efficient movement of goods and people.
6. **Water Supply Systems:** Sources of water; reservoirs and holding facilities; aqueducts and other transport systems; filtration, cleaning, and treatment systems; pipelines; cooling systems; and other delivery mechanisms that provide for domestic and industrial

²⁶ Instituted via Executive Order 13010, which was signed by President Clinton in 1996.



applications, including systems for dealing with water runoff, wastewater, and firefighting.

7. **Government Services:** Capabilities at the federal, state, and local levels of government required to meet the needs for essential services to the public.
8. **Emergency Services:** Medical, police, fire, and rescue systems.

Other assets such as public libraries, schools, museums, parks, recreational facilities, historic buildings or sites, churches, residential and/or commercial subdivisions, apartment complexes, and so forth, are classified as non-critical facilities and infrastructure, as they are not necessarily “critical” per the definition set forth in Executive Order 13010. They are however, very important to the county and the reader should not construe critical and non-critical to equate to important and non-important.

The MJPT performed a detailed asset inventory for each of the participating communities including Flagstaff, Page, Sedona, Williams, and Unincorporated Coconino County. The community of Fredonia opted to not participate in the planning process. Information collected included the facility’s physical location and/or mailing address, description, contact information, replacement cost, potential economic loss, and size. Table 4-6 summarizes the number of facilities identified by category and community and Table 4-7 summarizes the total replacement costs and economic impact categorized by community. Replacement costs were generally estimated using tax assessor, insurance, or current market value estimates. The Unincorporated Coconino County data sets are compiled in Appendix H, which is a separately bound technical appendix that for security reasons, will not be generally distributed to the public. Appendix H may be viewed upon appointment with, and the supervision of, Coconino County officials.

Potential annual economic loss values are based on an estimate of the annual revenue attributed to each facility. It should be noted that replacement costs and economic loss values were not estimated for all structures and will require further investigation and estimates during future planning efforts.

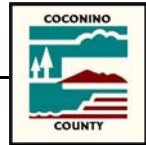


Table 4-6
Summary of critical and non-critical facilities in Coconino County

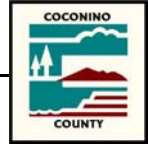
Facility Type	Flagstaff	Page	Sedona ²⁷	Williams	Unincorporated Coconino County	Coconino County Totals
Critical Facilities and Infrastructure						
Telecommunications Infrastructure	0	1	0	0	61	62
Electrical Power Systems	3	5	0	0	6	14
Gas and Oil Facilities	3	3	0	3	0	9
Banking and Finance Institutions	0	4	0	2	0	6
Transportation Networks	3	4	0	2	3	12
Water Supply Systems	63	8	13	1	17	102
Government Services	11	6	0	6	27	50
Emergency Services	11	3	4	5	12	35
Non-Critical Facilities and Infrastructure						
Residential	3	0	0	0	0	3
Educational	65	10	0	6	19	100
Cultural	17	8	0	15	12	52
Flood Control	0	0	0	0	0	0
Commercial Business	2	9	0	16	1	28

Table 4-7
Summary of estimated replacement and potential economic loss costs

Participating Community	Number of Facilities	Percent of All Coconino County Facilities	Total Estimated Replacement Cost	Potential Annual Economic Loss
All Coconino County	473	100%	\$10,621,319,462	\$210,461,178
Flagstaff	181	38%	\$140,588,070	\$210,461,178
Page	61	13%	\$10,393,049,999 ^a	\$0
Sedona	17	4%	\$2,090,000	\$0
Williams	56	12%	\$7,705,000	\$0
Unincorporated County	158	33%	\$77,886,393	\$0

^a – This number includes an estimated \$10 billion replacement cost for Glen Canyon Dam and associated facilities

²⁷ Portion of Sedona within Coconino County Only



4.3.2 Loss Estimations

Economic and human loss estimates for each of the major hazards identified in Section 4.2 begins with an assessment of the potential exposure of critical and non-critical assets and human populations to those hazards. Estimates of exposure to critical and non-critical assets identified by Coconino County communities is accomplished by intersecting the hazard profiles with the assets identified in Section 4.3.1. Human or population exposures are estimated by intersecting the same hazards with 2000 Census Data population statistics that have been re-organized into GIS compatible databases and distributed with HAZUS[®]-MH²⁸. *It is duly noted that the HAZUS Data population statistics may not exactly equate to the population statistics provided in Section 1.3.3 due to GIS positioning anomalies and the way HAZUS depicts certain census block data. However, the results are representative of the general magnitude of population exposures to the various hazards discussed.* Additional loss estimations for general residential, commercial, and industrial building stock inventories compiled in the HAZUS[®]-MH databases also represent a further depiction of the potential exposure.



DMA2K Citation

Requirement §201.6(c)(2)(ii)(B):

[The plan should describe vulnerability in terms of: ...] (B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate;

Due to limited resources and time, the detailed vulnerability analysis for this planning effort is limited to the top hazards indicated in Tables 4-2 and 4-5. With regard to the community assets and population, exposure risk for drought is not readily or easily defined geographically. Instead, exposure risks to these hazards are considered to be equal across the entire county. The top hazards identified in Tables 4-2 and 4-5 fitting this category include drought and thunderstorm/high winds.

Table 4-7 summarizes the county-wide exposure potential of all specific critical and non-critical facilities identified by the MJPT participants and communities. Table 4-8 summarizes the county-wide potential exposure for the human population and general

²⁸ U.S. Department of Homeland Security, Federal Emergency Management Agency, HAZUS[®]-MH, build 31



Table 4-8
Summary of county-wide potential exposure for human population and general residential, commercial, and industrial sector structures

Coconino County HAZUS Summary by Community	Population Exposed	Population Over 65	Incomes Under \$20K	Residential Building Count	Residential Building Value (x1000)	Residential Content Value (x1000)	Residential Potential Economic Impact (x1000)	Commercial Building Count	Commercial Building Value (x1000)	Commercial Content Value (x1000)	Commercial Potential Economic Impact (x1000)	Industrial Building Count	Industrial Building Value (x1000)	Industrial Content Value (x1000)	Industrial Potential Economic Impact (x1000)	Total of All Building and Content Exposure (x1000)
Totals	116312	7659	9480	42891	\$ 6,134,559	\$ 3,067,276	\$ 9,201,835	499	\$ 901,366	\$ 954,010	\$ 1,855,376	19	\$ 97,484	\$ 121,720	\$ 219,204	\$ 11,276,415
Flagstaff	53536	2772	4809	14541	\$ 2,684,319	\$ 1,342,160	\$ 4,026,479	315	\$ 585,922	\$ 626,698	\$ 1,212,620	11	\$ 59,459	\$ 75,218	\$ 134,677	\$ 5,373,776
Page	6809	377	459	2377	\$ 253,964	\$ 126,965	\$ 380,929	45	\$ 61,332	\$ 63,011	\$ 124,343	2	\$ 4,023	\$ 4,516	\$ 8,539	\$ 513,811
Sedona	2955	918	263	1545	\$ 272,058	\$ 136,015	\$ 408,073	36	\$ 64,163	\$ 65,855	\$ 130,018	1	\$ 3,748	\$ 5,106	\$ 8,854	\$ 546,945
Williams	2842	308	269	945	\$ 137,651	\$ 68,799	\$ 206,450	18	\$ 24,297	\$ 25,622	\$ 49,919	0	\$ 1,058	\$ 1,399	\$ 2,457	\$ 258,826
Unincorporated Areas	50170	3284	3680	23483	\$ 2,786,567	\$ 1,393,337	\$ 4,179,904	85	\$ 165,652	\$ 172,824	\$ 338,476	5	\$ 29,196	\$ 35,481	\$ 64,677	\$ 4,583,057
Coconino County HAZUS Summary by Community	% Population Exposed	% Population Over 65	% Incomes Under \$20K	% Residential Building Count	% Residential Building Value (\$)	% Residential Content Value (\$)	% Residential Potential Economic Impact (\$)	% Commercial Building Count	% Commercial Building Value (\$)	% Commercial Content Value (\$)	% Commercial Potential Economic Impact (\$)	% Industrial Building Count	% Industrial Building Value (\$)	% Industrial Content Value (\$)	% Industrial Potential Economic Impact (\$)	
Totals	100%	7%	8%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Flagstaff	46%	2%	4%	34%	44%	44%	44%	63%	65%	66%	65%	58%	61%	62%	61%	
Page	6%	0%	0%	6%	4%	4%	4%	9%	7%	7%	7%	11%	4%	4%	4%	
Sedona	3%	1%	0%	4%	4%	4%	4%	7%	7%	7%	7%	5%	4%	4%	4%	
Williams	2%	0%	0%	2%	2%	2%	2%	4%	3%	3%	3%	0%	1%	1%	1%	
Unincorporated Areas	43%	3%	3%	55%	45%	45%	45%	17%	18%	18%	18%	26%	30%	29%	30%	



residential, commercial, and industrial sectors. Specific loss estimates for each of the top hazards in Tables 4-2 and 4-5, and descriptions of the estimation methodology, are summarized according to hazard in the following paragraphs.

Drought – The impacts of drought to critical and non-critical facilities and building stock is generally indirect, in that drought is often a contributing factor to other hazards such as flooding and wildfire. Extended drought may weaken and dry the grasses, shrubs, and trees of wildfire areas, making them more susceptible to ignition. Drought also tends to reduce the vegetative cover in watersheds, and hence decreases the interception of rainfall and increases the flooding hazard. The sectors in Coconino County most directly impacted by drought are agriculture, ranching, potable water supplies, and recreation/tourism. The vulnerability and potential impact for this risk assessment will focus primarily on the potential economic impacts to agriculture and ranching. According to the Arizona Agricultural Statistics Service, which is a branch of the National Agricultural Statistic Service (NASS) and the U.S. Department of Agriculture (USDA), the estimated 2002 cash receipts²⁹ for crops and livestock in Coconino County was \$967,000 and \$13.98 million. It is plausible to assume that all of the Coconino County agriculture is vulnerable to drought, and in 2002, Coconino County farmers and ranchers received approximately \$459,000³⁰ in USDA disaster assistance, with most of it directly attributable to drought. Table 4-9 provides a summary of total cash receipts versus federal disaster assistance for 1998 through 2002. All dollars are adjusted to 2002 value for direct comparison. As previously discussed, 1997 to 1998 is believed to be the beginning of the current drought cycle. The results in Table 4-9 clearly indicate the increased federal disaster assistance with each consecutive year of drought, contrasted to decreased cash receipts on the part of the agricultural community, and especially the ranchers. Given this direct correlation, it is assumed that 100 percent of the disaster money is directly attributable to drought relief. Using the 2002 data, it is very reasonable to assume that continued drought could easily result in an annual agricultural disaster cost of \$0.5 million.

²⁹ U.S Department of Agriculture, Arizona Agricultural Statistics Service, 2004, *2002 Annual Statistics Bulletin*, as posted at the following URL: <http://www.nass.usda.gov/az/03bul/main.htm>

³⁰ Environmental Working Group, 2004, URL: http://www.ewg.org:16080/farm/progdetail.php?fips=04005&progcode=total_dis&page=

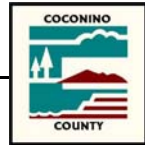


Table 4-9

Summary of agricultural economic and disaster assistance statistics for Coconino County

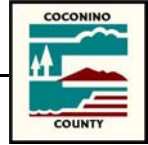
Year	Cash Receipts			Inflation Adjustment Factor	Inflation Adjusted Total	Disaster Dollars Received	Inflation Adjusted Disaster Dollars
	Crops	Livestock	Total				
All Dollar Amounts in Thousands of Dollars (x \$1,000)							
1998	1,717	34,550	36,267	1.09	39,500	0.0	0.0
1999	3,268	35,062	38,330	1.07	41,000	0.0	0.0
2000	1,273	27,128	28,401	1.04	29,500	41.9	43.6
2001	1,046	28,238	29,284	1.02	29,900	227.0	231.5
2002	967	13,989	14,956	1	15,000	459.3	459.3
References: Cash Receipts: USDA Arizona Agricultural Statistics Service, 2004 Inflation Adjustments: Consumer Price Index Disaster Dollars: Environmental Working Group, 2004							

Other economic losses associated with drought could include increased domestic water supply costs, increased wildfire risk and firefight costs, and impacts to tourism. According to the Arizona Office of Tourism³¹, Flagstaff's Snowbowl ski area attracted 90,000 visitors. The average for the ski area is around 125,000. Assuming a conservatively low gross expenditure of \$40 per person, the average gross seasonal expenditure would be approximately \$5 million. Assuming a local tax rate of 8 percent, the average tax revenues from the ski area would be around \$400,000. Using the 2002-2003 season as an example, the state and county experienced a loss of \$100,000 in tax revenues due to the ski season being limited by drought. Increased costs in water supply systems could also be expected, however, there are no readily available references for estimating these costs in relation to drought.

Combining the potential losses from each of these sectors, it is easily conceivable that annual costs due to drought for the county as a whole could add up to \$1 million or more.

Floods – The estimation of potential exposure to flooding was accomplished by intersecting the human and facility assets with the FEMA delineated 100-year and 500-year floodplain limits. Digital floodplain mapping was obtained from the Federal Emergency Management Agency (FEMA), Coconino County, and the Cities of Flagstaff and Sedona. Most of the

³¹ Arizona Office of Tourism, 2003, *Arizona Monthly Tourism Indicators*, February 2003.



delineated floodplains are based on FEMA Flood Insurance Rate Maps (FIRM) for Coconino County and associated communities. The 100-year floodplains (A Zones) are assumed to be high hazard areas. The 500-year (Zone B and Shaded Zone X) floodplains are assumed to be of medium hazard. Everything else is considered as low hazard. Loss estimates to all facilities located within the 100-year and 500-year floodplains were made based on the loss estimation tables published by FEMA³². Most of the assets located within high hazard flood areas will be subject to three feet or less of flooding. Using the FEMA tables, it is assumed that all specifically identified assets located within the high hazard areas will have a loss-to-exposure ratio of 0.20 (or 20%). A loss to exposure ratio of 0.05 (5%) is assumed for the HAZUS exposure data to account for the spatial variability of those data sets within the identified floodplain hazard areas. Similarly, loss to exposure ratios of 0.025 (2.5%) and 0.01 (1%) are used for the MJPT identified assets and HAZUS structures located in the medium hazard areas. For economic losses (where reported), it is assumed that high and medium flood hazard facilities will be unproductive for 30 and 7 days, respectively. Table 4-10 summarizes the MJPT identified assets that are potentially exposed to 100-year and 500-year flood events, and the corresponding estimates of losses. Table 4-11 summarizes the HAZUS human population exposure to the 100-year and 500-year flooding. Table 4-12 summarizes estimates of the county-wide exposure of HAZUS residential, commercial and industrial building stock.

In summary, \$22.5 million in flood losses to MJPT identified assets are estimated for all communities within Coconino County. An additional \$41.2 million in damages is estimated using the HAZUS data for general residential, commercial and industrial sectors. Assuming no overlap between the HAZUS data set and the asset inventory, a total of potential loss exposure of \$63.7 million is estimated for flood losses. This amount seems reasonable, especially when compared to historic flooding damages experienced during major storms. Regarding human vulnerability, a total population of 5,998 people, or 5.2 percent of the total Coconino County population, are potentially exposed to a 100-year flood hazard. Similarly, a total population of 5,954 people, or 5.1 percent of the total Coconino County

³² FEMA, 2001, *Understanding Your Risks; Identifying Hazards and Estimating Losses*, FEMA Document No. 386-2



Table 4-10

Summary of Coconino County asset inventory loss estimates due to flooding

Community	Impacted Facilities	Impacted Facility Percentages	Estimated Replacement Cost	Potential Economic Loss	Estimated Structure Loss	Estimated Economic Loss	Total Loss Estimate
High Flood Hazard (100-Year)							
County-Wide Totals	31	100.00%	\$40,878,797	\$171,712,272	\$8,175,759	\$14,113,337	\$22,289,097
Flagstaff	16	51.61%	\$32,653,797	\$171,712,272	\$6,530,759	\$14,113,337	\$20,644,097
Page	0	0.00%	\$0	\$0	\$0	\$0	\$0
Sedona ^a	3	9.68%	\$625,000	\$0	\$125,000	\$0	\$125,000
Williams	5	16.13%	\$0	\$0	\$0	\$0	\$0
Unincorporated Areas	7	22.58%	\$7,600,000	\$0	\$1,520,000	\$0	\$1,520,000
Medium Flood Hazard (500-year Flood)							
County-Wide Totals	41	100.00%	\$4,629,813	\$0	\$231,491	\$0	\$231,491
Flagstaff	15	36.59%	\$2,500,000	\$0	\$125,000	\$0	\$125,000
Page	0	0.00%	\$0	\$0	\$0	\$0	\$0
Sedona ^a	1	2.44%	\$100,000	\$0	\$5,000	\$0	\$5,000
Williams	17	41.46%	\$225,000	\$0	\$11,250	\$0	\$11,250
Unincorporated Areas	8	19.51%	\$1,804,813	\$0	\$90,241	\$0	\$90,241
^a – Figures represent portion of Sedona within Coconino County only							

population, are potentially exposed to a 500-year flood hazard. Given the historic record, it is feasible to assume that at least one fatality and multiple injuries are plausible. It is very likely that with a significant flood like the 100-year event, a large percentage of exposed population could be displaced for a period of time.



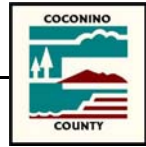
Table 4-11
Summary of Coconino County population sectors exposed to flooding

Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed	Total Incomes Under \$20K	Incomes Under \$20K Exposed	Percent of Incomes Under \$20K Exposed
High Flood Hazard (100-Year)									
County-Wide Totals	116312	5998	5.16%	7659	286	3.73%	9480	616	6.50%
Flagstaff	53536	5201	9.71%	2772	176	6.35%	4809	543	11.29%
Page	6809	0	0.00%	377	0	0.00%	459	0	0.00%
Sedona ^a	2955	130	4.40%	918	56	6.10%	263	8	3.04%
Williams	2842	305	10.73%	308	33	10.71%	269	30	11.15%
Unincorporated Areas	50170	362	0.72%	3284	21	0.64%	3680	35	0.95%
Medium Flood Hazard (500-year Flood)									
County-Wide Totals	116312	5954	5.12%	7659	458	5.98%	9480	516	5.44%
Flagstaff	53536	4731	8.84%	2772	318	11.47%	4809	416	8.65%
Page	6809	0	0.00%	377	0	0.00%	459	0	0.00%
Sedona ^a	2955	16	0.54%	918	4	0.44%	263	0	0.00%
Williams	2842	878	30.89%	308	107	34.74%	269	81	30.11%
Unincorporated Areas	50170	329	0.66%	3284	29	0.88%	3680	19	0.52%
^a — Figures represent portion of Sedona within Coconino County only									



Table 4-12
Summary of HAZUS population and building exposure by hazard

Coconino County HAZUS Summary	Population Exposed	Population Over 65	Incomes Under \$20K	Residential Building Count	Residential Building Value (x\$1000)	Residential Content Value (x\$1000)	Residential Potential Economic Impact (x\$1000)	Commercial Building Count	Commercial Building Value (x\$1000)	Commercial Content Value (x\$1000)	Commercial Potential Economic Impact (x\$1000)	Industrial Building Count	Industrial Building Value (x\$1000)	Industrial Content Value (x\$1000)	Industrial Potential Economic Impact (x\$1000)	Total of All Building and Content Exposure (x\$1000)	Total Estimated Loss (x\$1000)
County-Wide Totals	116312	7659	9480	42891	\$ 6,134,559	\$ 3,067,276	\$ 9,201,835	499	\$ 901,366	\$ 954,010	\$ 1,855,376	19	\$ 97,484	\$ 121,720	\$ 219,204	\$ 11,276,415	
Flood																	
High Risk	5998	286	616	2123	\$ 383,679	\$ 191,835	\$ 575,514	31	\$ 59,258	\$ 60,777	\$ 120,035	0	\$ 2,865	\$ 3,617	\$ 6,482	\$ 702,031	\$ 35,102
Medium Risk	5954	458	516	1728	\$ 282,794	\$ 141,384	\$ 424,178	39	\$ 86,318	\$ 88,241	\$ 174,559	0	\$ 5,754	\$ 7,518	\$ 13,272	\$ 612,009	\$ 6,120
Wildfire																	
Extreme Risk	32366	3036	2215	18038	\$ 2,418,209	\$ 1,209,095	\$ 3,627,304	85	\$ 178,468	\$ 184,016	\$ 362,484	9	\$ 33,987	\$ 38,799	\$ 72,786	\$ 4,062,574	\$ 2,031,287
High Risk	19006	1092	924	7322	\$ 1,167,514	\$ 583,758	\$ 1,751,272	27	\$ 59,938	\$ 65,204	\$ 125,142	1	\$ 6,472	\$ 7,532	\$ 14,004	\$ 1,890,418	\$ 378,084
Medium Risk	23070	1524	2089	7016	\$ 939,689	\$ 469,852	\$ 1,409,541	83	\$ 134,776	\$ 138,671	\$ 273,447	3	\$ 11,226	\$ 14,170	\$ 25,396	\$ 1,708,384	\$ 85,419
Coconino County HAZUS Summary	% Population Exposed	% Population Over 65	% Incomes Under \$20K	% Residential Building Count	% Residential Building Value	% Residential Content Value	% Residential Potential Economic Impact	% Commercial Building Count	% Commercial Building Value	% Commercial Content Value	% Commercial Potential Economic Impact	% Industrial Building Count	% Industrial Building Value	% Industrial Content Value	% Industrial Potential Economic Impact		
Flood	10.28%	9.71%	11.94%	8.98%	10.86%	10.86%	10.86%	14.03%	16.15%	15.62%	15.88%	0.00%	8.84%	9.15%	9.01%		
High Risk	5.16%	3.73%	6.50%	4.95%	6.25%	6.25%	6.25%	6.21%	6.57%	6.37%	6.47%	0.00%	2.94%	2.97%	2.96%		
Medium Risk	5.12%	5.98%	5.44%	4.03%	4.61%	4.61%	4.61%	7.82%	9.58%	9.25%	9.41%	0.00%	5.90%	6.18%	6.05%		
Wildfire	64.00%	73.80%	55.15%	75.48%	73.77%	73.77%	73.77%	39.08%	41.40%	40.66%	41.02%	68.42%	53.02%	49.71%	51.18%		
Extreme Risk	27.83%	39.64%	23.36%	42.06%	39.42%	39.42%	39.42%	17.03%	19.80%	19.29%	19.54%	47.37%	34.86%	31.88%	33.20%		
High Risk	16.34%	14.26%	9.75%	17.07%	19.03%	19.03%	19.03%	5.41%	6.65%	6.83%	6.74%	5.26%	6.64%	6.19%	6.39%		
Medium Risk	19.83%	19.90%	22.04%	16.36%	15.32%	15.32%	15.32%	16.63%	14.95%	14.54%	14.74%	15.79%	11.52%	11.64%	11.59%		



Wildfire – Estimates of human and asset exposure to wildfire is accomplished by intersecting the asset inventory and HAZUS data with wildfire hazards presented in Section 4.2.

Exposure to three wildfire hazard types; extreme, high, and medium, were estimated for each data set. Since no common methodology is available for estimating losses from the exposed values, estimates of the loss-to-exposure ratios were assumed based on the perceived intensity of a fire hazard. The resultant losses were then compared to historic records for a level of indirect verification. The loss-to-exposure ratios for the extreme, high, and medium wildfire hazard areas were estimated to be 0.5, 0.2, and 0.05, respectively. Economic losses are estimated assuming that the facility will be unproductive for 30 days for all scenarios. Table 4-13 summarizes the asset exposures to each of the three categories and to wildfire as a whole. Table 4-14 summarizes the HAZUS human population exposure to the various wildfire hazards. HAZUS building inventories impacted by wildfire are summarized in Table 4-12.

In summary, \$103.2 million in wildfire losses to MJPT identified assets is estimated for all communities within Coconino County. An additional \$2.49 billion in damages is estimated using the HAZUS data for general residential, commercial and industrial sectors. Assuming no overlap between the HAZUS data set and the asset inventory, a total potential loss exposure of \$2.59 billion is estimated for wildfires. It is highly unlikely that any fire would burn across the entire county in a given event, and the incident specific damage costs are likely to be only a fraction of those presented. However, as a collective evaluation, the loss estimate seems reasonable. Regarding human vulnerability, a total population of 74,442 people, or 64.0 percent of the total Coconino County population, is potentially exposed to at least a medium wildfire hazard. Typically, deaths and injuries not related to firefighting activities are rare. However, it is feasible to assume that at least one death and/or injury is plausible. There is also a high probability of some population displacement during a wildfire event, especially in the urban wildland interface communities.



Table 4-13

Summary of Coconino County asset inventory loss estimates due to wildfire

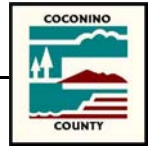
Community	Impacted Facilities	Impacted Facility Percentages	Estimated Replacement Cost	Potential Economic Loss	Estimated Structure Loss	Estimated Economic Loss	Total Loss Estimate
Extreme Wildfire Hazard							
County-Wide Totals	246	100.00%	\$137,667,564	\$210,103,806	\$68,833,782	\$17,268,806	\$86,102,588
Flagstaff	81	32.93%	\$93,891,519	\$210,103,806	\$46,945,760	\$17,268,806	\$64,214,565
Page	0	0.00%	\$0	\$0	\$0	\$0	\$0
Sedona ^a	17	6.91%	\$2,090,000	\$0	\$1,045,000	\$0	\$1,045,000
Williams	56	22.76%	\$7,705,000	\$0	\$3,852,500	\$0	\$3,852,500
Unincorporated Areas	92	37.40%	\$33,981,045	\$0	\$16,990,523	\$0	\$16,990,523
High Wildfire Hazard							
County-Wide Totals	19	100.00%	\$54,200,000	\$0	\$10,840,000	\$0	\$10,840,000
Flagstaff	15	78.95%	\$2,800,000	\$0	\$560,000	\$0	\$560,000
Page	1	5.26%	\$50,000,000	\$0	\$10,000,000	\$0	\$10,000,000
Sedona ^a	0	0.00%	\$0	\$0	\$0	\$0	\$0
Williams	0	0.00%	\$0	\$0	\$0	\$0	\$0
Unincorporated Areas	3	15.79%	\$1,400,000	\$0	\$280,000	\$0	\$280,000
Medium Wildfire Hazard							
County-Wide Totals	62	100.00%	\$10,124,411,999	\$0	\$6,220,600	\$0	\$6,220,600
Flagstaff	1	1.61%	\$0	\$0	\$0	\$0	\$0
Page	34	54.84%	\$10,123,799,999 ^b	\$0	\$6,190,000 ^c	\$0	\$6,190,000
Sedona ^a	0	0.00%	\$0	\$0	\$0	\$0	\$0
Williams	0	0.00%	\$0	\$0	\$0	\$0	\$0
Unincorporated Areas	27	43.55%	\$612,000	\$0	\$30,600	\$0	\$30,600
^a – Figures represent portion of Sedona within Coconino County only ^b – Includes \$10 billion for Glen Canyon Dam ^c – Does not includes any losses for Glen Canyon Dam							



Table 4-14
Summary of Coconino County population sectors exposed to wildfire hazard

Community	Total Population	Population Exposed	Percent of Population Exposed	Total Population Over 65	Population Over 65 Exposed	Percent of Population Over 65 Exposed	Total Incomes Under \$20K	Incomes Under \$20K Exposed	Percent of Incomes Under \$20K Exposed
<i>Extreme Wildfire Hazard</i>									
County-Wide Totals	116312	32366	27.83%	7659	3036	39.64%	9480	2215	23.36%
Flagstaff	53536	8272	15.45%	2772	481	17.35%	4809	680	14.14%
Page	6809	0	0.00%	377	0	0.00%	459	0	0.00%
Sedona ^a	2955	2955	100.00%	918	918	100.00%	263	263	100.00%
Williams	2842	2842	100.00%	308	308	100.00%	269	269	100.00%
Unincorporated Areas	50170	18297	36.47%	3284	1329	40.47%	3680	1003	27.26%
<i>High Wildfire Hazard</i>									
County-Wide Totals	116312	19006	16.34%	7659	1092	14.26%	9480	924	9.75%
Flagstaff	53536	16042	29.96%	2772	887	32.00%	4809	821	17.07%
Page	6809	0	0.00%	377	0	0.00%	459	0	0.00%
Sedona ^a	2955	0	0.00%	918	0	0.00%	263	0	0.00%
Williams	2842	0	0.00%	308	0	0.00%	269	0	0.00%
Unincorporated Areas	50170	2964	5.91%	3284	205	6.24%	3680	103	2.80%
<i>Medium Wildfire Hazard</i>									
County-Wide Totals	116312	23070	19.83%	7659	1524	19.90%	9480	2089	22.04%
Flagstaff	53536	0	0.00%	2772	0	0.00%	4809	0	0.00%
Page	6809	2840	41.71%	377	138	36.60%	459	114	24.84%
Sedona ^a	2955	0	0.00%	918	0	0.00%	263	0	0.00%
Williams	2842	0	0.00%	308	0	0.00%	269	0	0.00%
Unincorporated Areas	50170	20230	40.32%	3284	1386	42.20%	3680	1975	53.67%

^a — Figures represent portion of Sedona within Coconino County only



Winter Storms – All of Coconino County is exposed to some level of winter storm hazard.

Figures 4-5 through 4-8 depict the geographically varying levels of exposure winter storm snow depths for various recurrence intervals. The National Weather Service in Flagstaff³³, uses the following criteria for issuing warnings about winter storm weather:

1. **Blizzard Warning:** Sustained winds or frequent gusts of 35 mph or more, AND visibility frequently below 1/4 mile in considerable snow and/or blowing snow, AND above conditions are expected to prevail for 3 hours or longer.

2. **Winter Storm Warning:** Issued when more than one winter hazard is involved producing life threatening conditions, such as a combination of heavy snow, strong winds producing widespread blowing and drifting snow, freezing rain, or wind chill.

3. **Heavy Snow Warning Criteria:**

Above 8500 ft	12 inches/12 hrs	18 inches/24 hrs
7000 to 8500 ft	8 inches/12 hrs*	12 inches/24 hrs*
5000 to 7000 ft	6 inches/12 hrs	10 inches/24 hrs
Below 5000 ft	2 inches/12 hrs	4 inches/24 hrs

*(Flagstaff is in this range)

4. **Snow Advisory Criteria:**

Above 8500 ft	6 to 12 inches/12hrs	12 to 18 inches/24 hrs
7000 to 8500 ft	4 to 8 inches/12 hrs*	8 to 12 inches/24 hrs*
5000-7000 ft	3 to 6 inches/12 hrs	6 to 10 inches/24 hrs
Below 5000 ft	1 to 2 inches/12 hrs	2 inches/24 hrs**

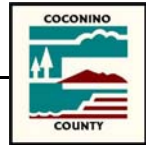
*(Flagstaff's elevation)

**or snow accumulation in any location where it is a rare event.

5. **Blowing Snow Advisory Criteria:** Visibility frequently at or below 1/4 mile.

6. **High Wind Warning Criteria:** Issued for strong winds not associated with severe local storms. These include: gradient, mesoscale, and channeled winds;

³³ Based on information posted at the following NWS URL: <http://www.wrh.noaa.gov/fgz/safety/criteria.php?wfo=fgz>



Foehn/Chinook/downslope winds; and winds associated with tropical cyclones. The criteria:

Sustained winds	40 mph or greater	last 1 hr or longer
Wind gusts	58 mph or greater	for any duration

7. **Wind Advisory:** Issued for the same types of wind events as a High Wind Warning, but at lower speed thresholds. The criteria:

Sustained winds	30-39 mph	last 1 hr or longer
Wind gusts	40-57 mph	for any duration

8. **Visibility Hazards:** Visibility reduced to 1/4 mile or less by fog, blowing dust/sand, and smoke.

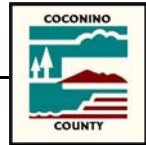
9. **Wind Chill:** Issued for a wind chill factor of minus 20 degrees Fahrenheit or colder

10. **Freezing Rain/Drizzle, or Sleet:** widespread, dangerous, and damaging accumulations of ice or sleet.

11. **Frost or Freeze Warning:** Issued when temperatures are critical for crops and sensitive plants. Criteria is season dependent, but usually a freeze warning is appropriate when temperatures are expected to fall below freezing for at least 2 hours.

Inspection of Figure 4-5 would indicate that for much of Coconino County, there is a 10 percent probability that a heavy snow warning could be issued in any given year. All of the county population and assets are exposed to winter storm. Given the historic record, it is estimated that an annual loss of \$500,000 could be expected. It is also anticipated that at least one fatality and multiple injuries will result.

Transportation Accidents – Potential losses and damages due to major transportation accidents are difficult to estimate without extensive research, compilation, and statistical analysis of often hard to obtain data. No such studies currently exist for Coconino County, therefore, no detailed estimates of potential human and property losses and damages will be made. In many instances, transportation accidents are often caused by a combination of weather related events such as high winds, dust/sand storms, rain, snow, or ice and the corresponding human reactions to them. In Coconino County, the two primary categories of accident potential are either ground based or air based. Ground based incidents include



roadway and railway accidents. Air based incidents involve the failure of aircraft during take-off, flight, and/or landing sequences. For both types of incidents, it is reasonable to project that the entire county and community assets and population are potentially exposed to an accident in one form or another.

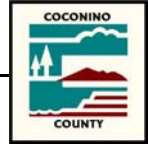
High risk vehicular corridors include Interstates 17 and 40, U.S. Highways 89, 89A, 160, 180, and State Routes 64, 67, 87, 98, 99, and 264. The higher speeds and greater numbers of vehicles along these corridors combine to create an increased risk for major accidents, and especially around town and city population centers. Figure 4-10 is an excerpt from vehicular crash statistics for Coconino published by the Motor Vehicle Division of the Arizona Department of Transportation³⁴. It is interesting to note that the most number of crashes resulting in fatalities occur on the State and Other Rural Roads. This is likely due to the higher rates of speed and increased potential for multiple vehicle accidents.

COUNTIES Cities	Total	Number of Crashes			No. of Persons		Alcohol-Related		
		Fatal	Injury	Property Damage	Killed	Injured	Crashes	Killed	Injured
COCONINO COUNTY									
Flagstaff	1,945	5	521	1,419	5	799	98	0	62
Fredonia	6	0	4	2	0	4	0	0	0
Page	101	1	28	72	1	38	15	1	7
Sedona	288	3	74	211	3	108	18	2	11
Williams	98	0	24	74	0	46	2	0	1
State Rural Roads	1,336	28	431	877	34	753	73	2	83
Other Rural Roads	361	14	125	222	14	197	32	3	22
TOTAL	4,135	51	1,207	2,877	57	1,945	238	8	186

Figure 4-10
2003 Crash Statistics for Coconino County

High risk railway corridors are generally the areas where railroads pass through the more densely populated towns and cities. Incidents typically involve either vehicular or pedestrian contact with moving trains and are often fatal to those struck by the train. There are a number of reported vehicle/train and pedestrian/train incidents resulting in a fatality in the historic hazard database (see Appendix F and Table 4-3), and hence it is realistic to expect

³⁴ ADOT, MVD, 2003, *2003 Motor Vehicle Crash Facts for the State of Arizona*



that future fatalities will occur. Other hazards typically associated with railway accidents include hazardous material spills and ignition of wildfires.

The highest risk areas associated with aviation corridors are the areas typically identified as runway protection zones (RPZ). These trapezoidal areas extend from either end of the runway for a sufficient distance to allow safe take-off and approach angles. They are also the areas with the highest risk of aircraft accidents outside of the runway itself. Figures 4-11 and 4-12 present depictions of the RPZs for the Flagstaff-Pulliam Airport and Page Municipal Airport.

4.3.3 *Development Trend Analysis*

Coconino County has experienced moderate growth over the last five years, with much of the growth occurring around existing population centers and cities. As indicated in Table 1-1, nearly half of the county population is located in Flagstaff. Future growth and development is expected to continue in the same general population areas and will likely be limited to the availability of infrastructure and land.

Drought – Water for domestic purposes in Coconino County is very dependent upon seasonal replenishment by rain and snow-pack. For most of the unincorporated county, water is unavailable or very difficult to obtain. Depth to groundwater typically exceeds 1,000 feet, making wells prohibitively expensive. In some areas, residents share deep wells or form private water companies. Many residents must haul water obtained from municipal standpipes, private water companies, and private wells. Future growth will result in increased demands for existing surface water and groundwater supplies. Drought planning should be a critical component of any domestic water system expansions or land development planning. It is unlikely that significant growth will occur in the ranching and farming sectors given the current constraints on grazing rights and available range land.

Flooding – The County currently regulates, and will continue to regulate, the 100-year floodplains using a county floodplain management ordinance and FEMA FIRM maps. Challenges to the new growth will include the need for master drainage planning and additional floodplain delineations to identify and map the flood hazards within the growth areas where no mapping currently exists.

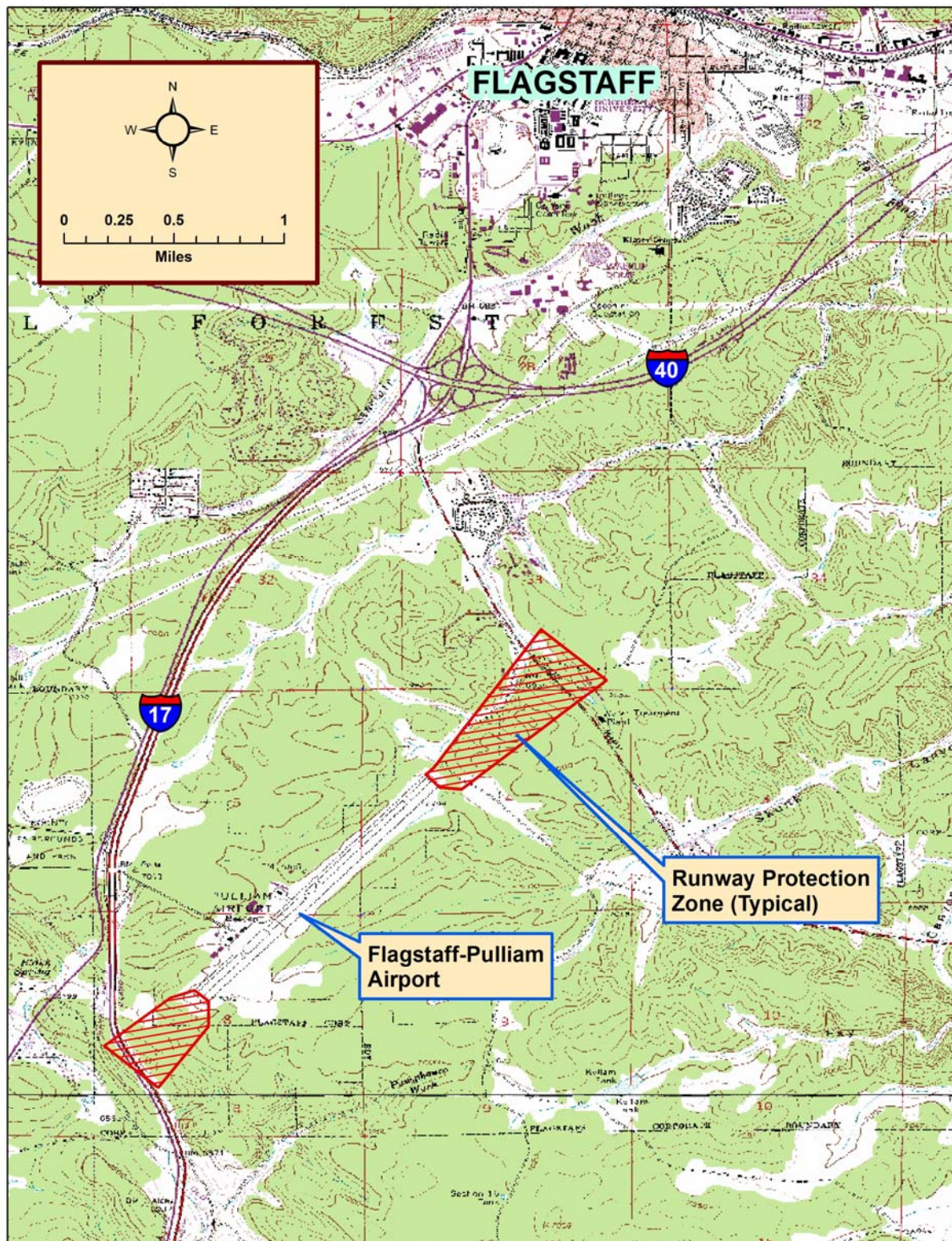


Figure 4-11

Runway Protection Zones for Flagstaff-Pulliam Airport

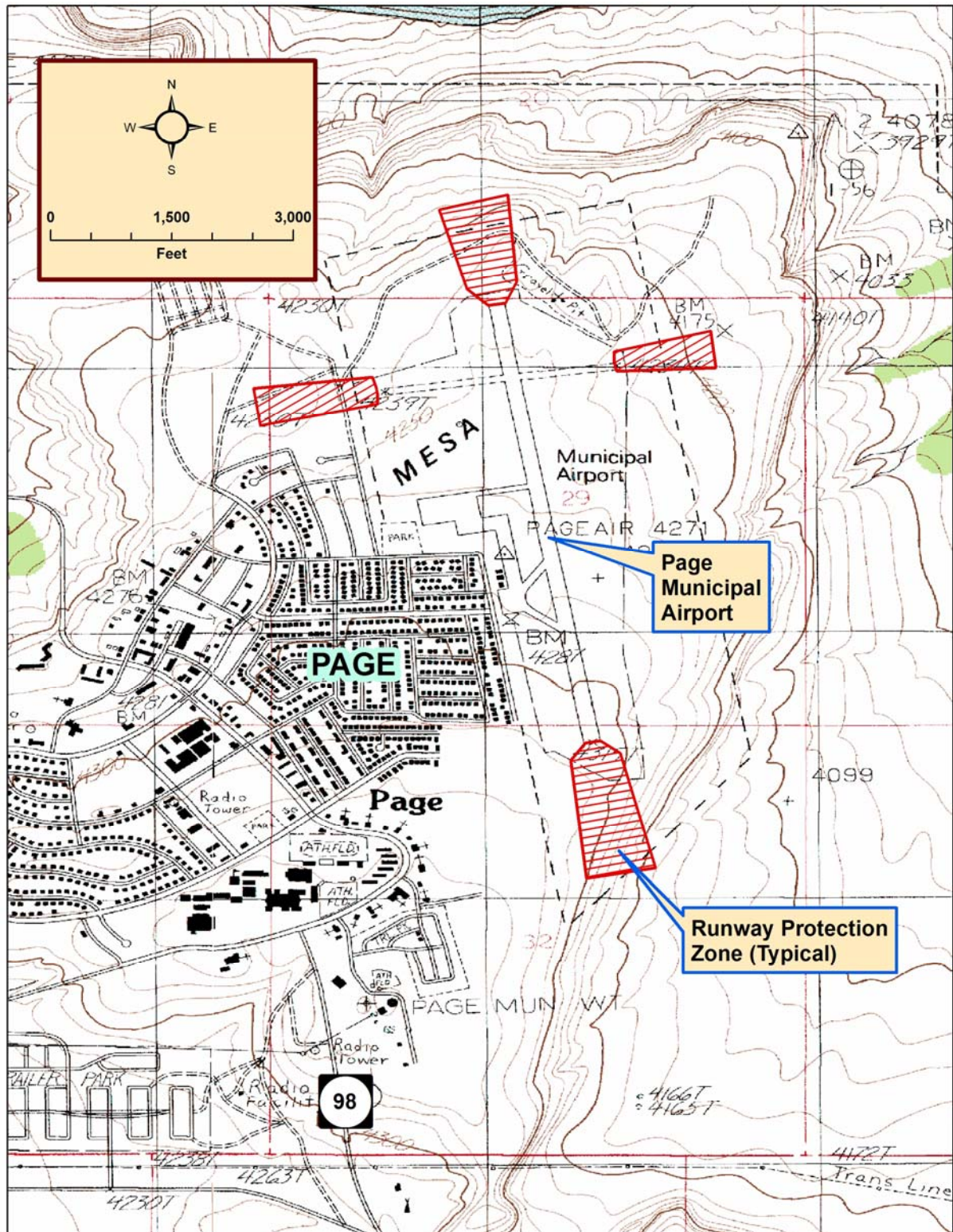
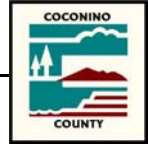


Figure 4-12

Runway Protection Zones for Page Municipal Airport

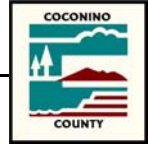


Wildfire – As previously discussed, wildfire risks are very significant for a sizeable portion of the county. Any future development will only increase the urban/wildland interface (UWI) areas and expand the potential exposure of structures to wildfire hazards. The CWPP addresses mitigation opportunities for expanding UWI areas and provides recommended guidelines for safe building and land-use practices in wildfire hazard areas.

Winter Storm – All future development in Coconino County will be impacted by winter storms. The county currently implements design standards that include provisions for snowloads on structures and natural ventilation.

Transportation – Any future development will require some level of expansion of the transportation systems, and will certainly increase traffic in the growth areas. Proposed development adjacent to the more heavily use corridors should strive to limit the human exposure to potential accidents through the use of setbacks and clear zones.

Other hazards identified will obviously have some impact on any future development or growth; however, none warrant any special considerations beyond those generally discussed in the vulnerability assessment sections of this plan.



SECTION 5: MITIGATION STRATEGY

The following section summarizes the strategy developed by Coconino County for mitigating hazard risks identified and summarized in Section 4. The mitigation strategy provides the “*what, when, and how*” of actions that will reduce or possibly remove the community’s exposure to hazard risks. According to DMA2K, the primary components of the mitigation strategy are generally categorized into the following components:

- ☒ **Capability Assessment**
- ☒ **Goals and Objectives**
- ☒ **Mitigation Actions/Projects**
- ☒ **Implementation Strategy**



DMA2K Citation

Requirement §201.6(c)(3):

[The plan shall include:...] (3) A mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

5.1 Capability Assessment

A formal capability assessment is not required for local hazard mitigation plans under the DMA2K legislation; however, the assessment does provide information that is helpful to assessing a community’s ability to mitigate against hazards. The Coconino County staff reviewed and evaluated the county’s resources and capabilities in the following general areas:

- **Existing Plans, Policies, and Ordinances**
- **Technical/Staff Resources**
- **Financial Resources**

A summary of the legal and regulatory capabilities of Coconino County, including existing plans, ordinances, and policies, is provided in Table 5-1. A summary of the administrative and technical resources available to the county is provided in Table 5-2. Financial capabilities, including taxing authority and grant eligibilities, are summarized in Table 5-3.

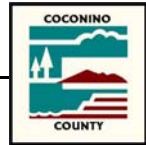


Table 5-1
Summary of Coconino County legal and regulatory capabilities

Regulatory Tools (Ordinances, Codes, and Plans)	Local Authority (Y/N)	Does State Prohibit? (Y/N)	Higher Level of Jurisdictional Authority (Y/N)	Comments
Building Code	Y	N	N	Uniform Building Code and Related Codes adopted 8/20/01, Ordinance. No. 01-13 (supersedes previous codes).
Zoning Ordinance	Y	N	N	Coconino County Zoning Ordinance, adopted 8/3/81, Ordinance No. 81-1 (with subsequent amendments).
Subdivision Ordinance or Regulations	Y	N	N	Coconino County Subdivision Ordinance, adopted 5/3/82, Ordinance No. 82-3 (with subsequent amendments).
Special Purpose Ordinances	Y	N	N	Floodplain Management Overlay Zone (Section. 13-6, Coconino County Zoning Ordinance). Development of environmentally sensitive lands ordinance anticipated FY '05.
Growth Management Ordinances	N	N	N	No GM ordinance; Comprehensive Plan contains goals and policies related to future growth and development.
Site Plan Review Requirements	Y	N	N	Administrative review required prior to issuance of building permits.
General or Comprehensive Plan	Y	N	N	Coconino County Comprehensive Plan adopted September 23, 2003. Includes sections related to environmentally sensitive lands, natural hazards, and emergency response, among others (supersedes previous Comp Plan).
Capital Improvements Plan	Y	N	N	Initial development of the county's first CIP began in late 2003; anticipated to be adopted with FY '05 budget in June 2004.
Economic Development Plan	Y	N	Y	Economic development handled by the Greater Flagstaff Economic Council (GFEC), a private non-profit agency with support from the City of Flagstaff and Coconino County.
Emergency Response Plan	N	N	N	

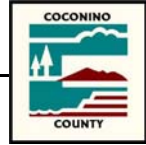


Table 5-1

Summary of Coconino County legal and regulatory capabilities

Regulatory Tools (Ordinances, Codes, and Plans)	Local Authority (Y/N)	Does State Prohibit? (Y/N)	Higher Level of Jurisdictional Authority (Y/N)	Comments
Post-Disaster Recovery Plan	N	N	N	
Post-Disaster Recovery Ordinance	N	N	N	
Real Estate Disclosure Statement	N	N	Y	“Public Reports” for subdivisions issued by Arizona Department of Real Estate; additional disclosure requirements for “lot split” properties required under Arizona Revised Statutes Title 33.
Other	Y	N	N	<ol style="list-style-type: none"> As amendments to the Comprehensive Plan, 10 “Area Plans” have been adopted since 1985. Each serves a defined geographic area or community. “Flagstaff Area Regional Land use and Transportation Plan” adopted by the City of Flagstaff and Coconino County in 2001; applicable to City of Flagstaff and unincorporated areas within the Flagstaff Metropolitan Planning Organization (FMPO) boundaries.



Table 5-2
Summary of Coconino County technical staff and personnel capabilities

Staff/Personnel Resources	<input checked="" type="checkbox"/>	Department/Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	✓	Community Development (Planning & Zoning Div.): Planners
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	✓	Community Development (Building & Safety Div.): Building Official, Plans Examiners, Building Inspectors; Public Works: County Engineer & staff
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	✓	Community Development (Planning and Zoning Div.): Planners; Public Works: County Engineer, Hydrologist, Emergency Services Coordinator
Floodplain Manager	✓	Community Development (Flood Control District): Floodplain Administrator, Planners
Surveyors	✓	Public Works: Surveyors
Staff with education or expertise to assess the community's vulnerability to hazards	✓	Community Development (Planning and Zoning Div.): Planners; Public Works: County Engineer, Hydrologist, Emergency Services Coordinator
Personnel skilled in GIS and/or HAZUS	✓	GIS Dept.
Scientists familiar with the hazards of the community		Not on County staff, but other agencies include NAU (various depts.), USFS, USGS, NRCS, NWS, and possibly others.
Emergency manager	✓	Public Works: Emergency Services Coordinator
Grant writer(s)	✓	Parks and Recreation Dept.

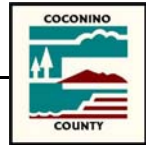


Table 5-3
Summary of Coconino County fiscal capabilities

Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)
Community Development Block Grants	Yes, but must apply for new grants
Capital Improvements Project funding	Yes, but must have voter approval
Authority to levee taxes for specific purposes	Yes, but must have voter approval
Fees for water, sewer, gas, or electric service	No, utilities are not owned by the County (except KVID – Kachina Village Improvement District water)
Impact fees for homebuyers or new developments/homes	Yes, but not used unless passed by voters
Incur debt through general obligation bonds	Yes, subject to voter approval
Incur debt through special tax bonds	Yes, special districts
Incur debt through private activity bonds	No
Withhold spending in hazard-prone areas	No
Other	

Table 5-4 provides a summary of existing plans and studies with elements of hazard mitigation that have been prepared by and for Coconino County in the past.

In summary, Coconino County currently has in place several regulatory mechanisms for mitigation of hazards, with most being directed at new construction and development. Staff resources are available for the identification, development and implementation of mitigation measures with some overlap of expertise in the various categories. Financially, the county has the ability to incur debt through tax and bond obligations and also to levy taxes for specific purposes. However, all of these mechanisms require political approval and are often difficult to implement. The greatest challenge faced by the County is to try and stay ahead of the rapid development growth with regulatory, planning and review resources that lag the needs by several years.



Table 5-4
Summary of existing plan and study documents for Coconino County

Plan/Study Name	Description	Plan/Study Author	Date Completed or Implemented	Plan/Study Owner
Coconino County Comprehensive Plan	General planning document addressing past and future growth related goals and objectives to provide a foundation for long term growth and development in the County	Coconino County Community Development Department	September 2003	Coconino County
Oak Creek Canyon Area Plan and Design Review Overlay	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1984	Coconino County
Bellemont Area Plan	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1985	Coconino County
Doney Park Area Plan and Design Review Overlay	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1988	Coconino County
Fort Valley Area Plan	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1990	Coconino County
Mountainairre Area Plan	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1991	Coconino County
Red Lake Area Plan	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1992	Coconino County
Doney Park/Timberline/Fernwood Transportation Plan	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1997	Coconino County
Kachina Village Area Plan and Design Review Overlay	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1997	Coconino County

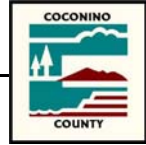
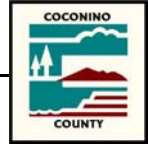


Table 5-4

Summary of existing plan and study documents for Coconino County

Plan/Study Name	Description	Plan/Study Author	Date Completed or Implemented	Plan/Study Owner
Tusayan Area Plan and Design Review Overlay	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1997	Coconino County
Valle Area Plan	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	1999	Coconino County
Parks Area Plan	An appendix to the county comprehensive plan addressing specific planning and future growth issues for a specific area within the county.	Coconino County Community Development Department	2001	Coconino County
Greater Flagstaff Area Community Wildlife Protection Plan	A plan jointly prepared by the Greater Flagstaff Forests Partnership (GFFP) and the Pondera Fire Advisory Council (PFAC) to address wildfire hazards and mitigation strategies for the subject planning region	GFFP and PFAC (of which Coconino County is a member)	November, 2004	GFFP and PFAC
Flagstaff Area and Regional Land Use and Transportation Plan	Comprehensive plan for the City of Flagstaff and surrounding planning area addressing future land use and intermodal transportation elements	City of Flagstaff	2001	City of Flagstaff
Coconino County Building Code Guidelines	Comprehensive codes and guidelines for building structures in Coconino County	Coconino County Building & Safety Division, Department of Community Development	March, 2004	Coconino County
Coconino County Engineering Design and Construction Criteria Manual	Engineering design and infrastructure construction guidelines	Coconino County Public Works Department.	2001	Coconino County



5.2 Goals and Objectives

As a part of the mitigation strategy, DMA2K requires that each community prepare a list of mitigation goals. The State Plan defines goals and objectives as follows:

Goals – General guidelines that explain what you want to achieve. Goals are usually broad statements with long-term perspective.

Objectives – Defined strategies or implementation steps intended to attain the identified goals. Unlike goals, objectives are specific, measurable, and have a defined time horizon.



DMA2K Citation

Requirement §201.6(c)(3)(i):

[A mitigation strategy ... section shall include:] (i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

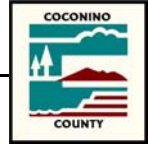
The MJPT met to develop and initial draft a set of common goals and objectives that could have application county-wide. The MJPT started with the goals and objectives developed by the State of Arizona for its hazard mitigation plan, and modified or revised the goals and objectives to better fit the desires of Coconino County communities. Each community then took those draft goals and objectives and further customized them to fit the individual community's needs and vision for hazard mitigation. The following is a list of the Coconino County goals and objectives:

Goal 1. Promote disaster-resistant future development.

- Objective 1.A Update, develop, and support their general plans, ordinances, and codes to limit development in hazard areas or build to standards that will prevent or reduce damage.
- Objective 1.B Adopt and support codes that protect assets and new development in hazard areas.

Goal 2. Promote public understanding, support, and demand for hazard mitigation.

- Objective 2.A Educate the public to increase awareness of hazards and opportunities for mitigation actions.
- Objective 2.B Promote partnerships between the state, counties, local and tribal governments to identify, prioritize, and implement mitigation actions.
- Objective 2.C Promote hazard mitigation in the business, residential, and agricultural community.
- Objective 2.D Monitor and publicize the effectiveness of mitigation actions implemented community wide.



Goal 3. Build and support local capacity and commitment to become less vulnerable to hazards.

- Objective 3.A Improve existing capabilities to warn the public of emergency situations.
- Objective 3.B Develop programs to enhance the safety of the residents of each community during an emergency.

Goal 4. Improve hazard mitigation coordination and communication with federal, state, local, and tribal governments.

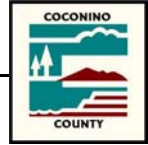
- Objective 4.A Establish and maintain closer working relationships with state agencies and local and tribal governments.

Goal 5. Reduce the level of damage and losses to people, existing and future critical facilities/infrastructure, and other community assets due to floods.

- Objective 5.A Implement policies, procedures and regulations which reduce the exposure to flood hazards.
- Objective 5.B Decrease vulnerability of community assets, especially critical facilities located in the 100-year floodplain.
- Objective 5.C Improve coordination with state and federal flood-related agencies.
- Objective 5.D Maintain compliance with the National Flood Insurance Program (NFIP) requirements.

Goal 6. Reduce the level of damage and losses to people, existing and future critical facilities/infrastructure, and other community assets due to wildland fires.

- Objective 6.A Develop a comprehensive approach to reducing the level of damage and losses due to wildland fires.
- Objective 6.B Protect life, improved property, and natural resources with vulnerability to the effects of wildland fires.
- Objective 6.C Improve coordination and support existing efforts to mitigate wildland fire hazards.
- Objective 6.D Develop a comprehensive database of information about the vulnerability of life, improved property, and natural resources to wildland fires.
- Objective 6.E Educate the public about wildland fire dangers and mitigation measures.



Goal 7. Reduce the level of damage and losses to people, existing and future critical facilities/infrastructure, and other community assets due to winter storms.

- Objective 7.A Develop a comprehensive approach to reducing the level of damage and losses due to winter storms.
- Objective 7.B Protect life, improved property, and natural resources with vulnerability to the effects of winter storms.

Goal 8. Reduce the level of damage and losses to people, existing and future critical facilities/infrastructure, and other community assets due to drought.

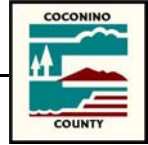
- Objective 8.A Develop a comprehensive approach to reducing the level of damage and losses due to drought.
- Objective 8.B Protect existing assets with vulnerability to the effects of drought.
- Objective 8.C Coordinate with and support existing efforts to mitigate drought (e.g., Arizona Governor's Arizona Drought Task Force).

Goal 9. Reduce the level of damage and losses to people, existing and future critical facilities/infrastructure, and other community assets due to transportation accidents.

- Objective 9.A Develop a comprehensive approach to reducing the level of damage and losses due to transportation accidents.
- Objective 9.B Protect existing assets with vulnerability to the effects of transportation accidents.
- Objective 9.C Coordinate with rail road companies and federal, state, county, and local transportation departments to develop accident mitigation cooperatives and agreements.

Goal 10. Reduce the level of damage and losses to people, existing and future critical facilities/infrastructure, and other community assets due to thunderstorms/high winds.

- Objective 10.A Develop a comprehensive approach to reducing the level of damage and losses due to thunderstorms/high winds.
- Objective 10.B Protect life, improved property, and natural resources with vulnerability to the effects of thunderstorms/high winds.



Goal 11. Reduce the level of damage and losses to people, existing and future critical facilities/infrastructure, and other community assets due to intentional human acts (e.g. – civil disobedience, civil disturbance, sabotage, and terrorism).

- Objective 11.A Develop a comprehensive approach to reducing the level of damage and losses due to intentional human acts.
- Objective 11.B Protect life, improved property, and natural resources with vulnerability to the effects of intentional human acts.
- Objective 11.C Facilitate communication of sharing intelligence among all levels of public safety communities and other affected agencies/organizations.
-

Goal 12. Reduce the level of damage and losses to people, existing and future critical facilities/infrastructure, and other community assets due to other natural hazards.

- Objective 12.A Develop a comprehensive approach to reducing the level of damage and losses due to other natural hazards.
- Objective 12.B Protect life, improved property, and natural resources with vulnerability to the effects of other natural hazards.
-

Goal 13. Reduce the level of damage and losses to people, existing and future critical facilities/infrastructure, and other community assets due to other human caused hazards.

- Objective 13.A Develop a comprehensive approach to reducing the level of damage and losses due to other human caused hazards.
- Objective 13.B Protect life, improved property, and natural resources with vulnerability to the effects of other caused hazards.
-

5.3 Mitigation Actions/Projects

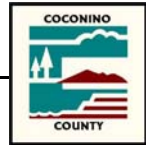
Mitigation actions/projects (A/P) are those activities identified by a community, that when implemented, will have the effect of reducing the community's exposure and risk to the particular hazard or hazards being mitigated. Using the results of the vulnerability analysis, the capability assessment, and the goals and objectives, the Coconino County planning team formulated a list of A/Ps for mitigation of the identified hazards within the county. The A/Ps identified can be generally classified as either structural or non-structural. Structural A/Ps typify a traditional "bricks and



DMA2K Citation

Requirement §201.6(c)(3)(ii):

[A mitigation strategy ... section shall include: ...] (ii) A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.



mortar” approach where physical improvements are provided to effect the mitigation goals.

Examples may include channels, culverts, bridges, detention basins, dams, emergency structures, and structural augmentations of existing facilities. Non-structural A/Ps deal more with policy, ordinance, and administrative changes, buy-out programs, and legislative actions.

The mitigation A/Ps developed for Coconino County include information for the following categories:

- **Identification and Description** – Each A/P is provided with a unique identifier and a description that summarizes the type, scope, and characteristics of the A/P, and the goal or goals addressed with the A/P.
- **Estimated Percent of Hazard or Hazards Mitigated** – Some A/Ps are directly associated with the mitigation of at least one or more hazards, and a subjective estimate of A/P effectiveness can be made in terms of the percent of hazard(s) mitigated. This percentage is then used for estimating the Benefit/Cost (B/C) ratio for that A/P. An “N/A” is coded for the A/Ps that do not apply.
- **Total A/P Cost** – For each A/P, a conceptual cost was estimated to assess the economic viability. For structural A/Ps, a conceptual construction cost estimate was made. For non-structural A/Ps, the cost was derived by estimating the approximate man-hour cost of staff time needed to implement the A/P.
- **Simplified Benefit/Cost Analysis** – The simplified B/C ratio methodology outlined in the Arizona Model Local Hazard Mitigation Plan will be employed to assess the economic viability of an A/P. For cases in which the application of this procedure is difficult or impractical, an arbitrary B/C ratio of 1.0 is assigned.
- **Evaluation and Local Prioritization** – The Coconino County planning team evaluated and ranked each A/P using the STAPLEE³⁵ procedure outlined in Step 2 of FEMA 386-3.

The mitigation A/Ps for Coconino County are summarized in Table 5-5, with each set of projects being tabulated in ranked order.

³⁵ FEMA, 2003, *Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies*, FEMA 386-3, pp 2-12 through 2-21 and Worksheet #4.



Table 5-5
Summary of Coconino County mitigation actions/projects

ID	Name	Description	Cost	Estimated Losses Due to Hazard	Percent of Hazard Mitigated	B/C Ratio	Social	Technical	Administrative	Political	Legal	Economic	Environmental	TOTAL
6.E.1	Wildfire Public Education Activities	Expand education activities to include N AZ Home Show, public service announcements, public access TV, website	\$35,000	\$2,590,000,000	0.01%	7.40	5	5	5	5	5	4	5	34
7.A.1	Wood Distribution Network	Establish wood transport and distribution network for the Navajo and Hopi Reservations of which approximately 75% of all households use wood to cook and heat	\$250,000	\$500,000	20.00%	0.40	5	5	3	5	5	5	5	33
6.A.1	GIS - Fire Data Layers	Develop additional GIS data layers including Sedona and Winona areas to facilitate future revisions of the greater Flagstaff area Community Wildfire Protection Plan	\$25,000	\$2,590,000,000	0.01%	10.36	5	5	4	5	5	4	5	33
6.D.1	Neighborhood Wildfire Assessment	Develop neighborhood wildfire assessment and rank at-risk neighborhoods with the goal to provide accurate wildfire information to residents and motivate them to implement personal and neighborhood mitigation measures	\$150,000	\$2,590,000,000	N/A	1.00	5	5	4	5	5	4	5	33
3.A.1	Siren / Alert System	Develop siren alert system for all-hazard warnings and announcements in outlying communities (e.g., Blue Ridge, Forest Lakes, Mormon Lake, Pinewood, etc.)	\$20,000	N/A	N/A	1.00	5	4	4	5	5	4	5	32
6.B.1	Small Diameter Wood Business Recruitment	Partner with the Greater Flagstaff Forests Partnership to conduct outreach and attract sustainable, small-diameter wood-based businesses into the area	\$150,000	\$2,590,000,000	0.01%	1.73	5	4	4	5	4	5	5	32
6.A.2	Fire District Formation	Educational programs and outreach to outlying areas of the county that are not currently served by any organized fire protection system with the goal to assist in organizing districts	\$20,000	\$2,590,000,000	0.01%	12.95	5	5	4	5	3	5	5	32
6.D.2	County Wildland Mapping for State GIS	Establish and maintain a county component of the state GIS mapping system documenting forest treatments, hazard data, grants, etc.	\$50,000	\$2,590,000,000	0.01%	5.18	5	4	4	5	5	4	4	31
6.A.3	Regional Fuels Crew	Support a multi-agency 20-person full-time crew dedicated to hazard fuel reduction, fire suppression, and public education in the greater Flagstaff area	\$1,000,000	\$2,590,000,000	1.00%	25.90	5	4	4	5	4	4	5	31
6.B.2	Roadside Thinning Project	Conduct roadside thinning along Forest Highway 3 (Lake Mary Road), Perkinsville Rd, Old Munds Hwy, Garland Prairie, and Spring Valley Rd to reduce vulnerability to the effects of wildfire	\$778,182	\$2,590,000,000	1.00%	33.28	4	5	4	5	5	4	4	31
3.A.2	Reverse 911 System	Purchase and implement Reverse 911 system out of Flagstaff Police / Sheriff / Fire Dispatch Center to warn public of emergency situations & other emergency related public announcements	\$120,000	N/A	N/A	1.00	4	4	3	5	5	4	5	30
6.C.1	Air Curtain Community Cleanups	Sponsor cleanup days in unincorporated communities of the county to assist in fuels reduction as a partnership with communities and the Forest Service	\$50,000	\$2,590,000,000	0.01%	5.18	4	5	4	5	4	4	4	30
11.C.1	Criminal Justice Information Network	Expand criminal justice vertical and horizontal data integration and provide for data integrity throughout the County with capability to link with regions and state systems to enhance information sharing regarding foreign and domestic threats	\$200,000	N/A	N/A	1.00	3	4	4	5	5	4	5	30
6.E.2	Fire Wise Community Programs	Develop Fire Wise programs to approximately 15 rural, outlying communities with high risk to wildfire threats, including instruction materials & facilitating partnerships with insurance agencies	\$25,000	\$2,590,000,000	0.01%	10.36	4	4	4	5	4	4	5	30



Table 5-5
Summary of Coconino County mitigation actions/projects

ID	Name	Description	Cost	Estimated Losses Due to Hazard	Percent of Hazard Mitigated	B/C Ratio	Social	Technical	Administrative	Political	Legal	Economic	Environmental	TOTAL
2.B.1	Community Wildfire Protection Plans	Develop comprehensive community forest planning and prioritization for Tusayan, Blue Ridge and other high risk communities that have not developed a CWPP	\$50,000	N/A	0.01%	1.00	5	4	4	4	4	4	5	30
7.A.2	National Weather Seminar	Partner with National Weather Service to provide multi-agency and media seminar to educate public on vulnerabilities to winter storms and other weather related events	\$5,000	\$500,000	1.00%	1.00	4	5	4	4	5	4	4	30
6.E.3	PFAC Education Trailer	Enhance PFAC Education Trailer and provide public information packets related to fire danger and mitigation measures (e.g. information on CWPP, fuels reductions, etc.)	\$15,000	\$2,590,000,000	0.01%	17.27	4	4	3	4	5	4	5	29
13.B.1	Seatbelt / Helmet Safety Campaign	I See Dead People educational program and outreach to beginning and experienced drivers to wear seatbelts, to bicyclists to wear helmets, and to other target audiences regarding dangers of operating under the influence of alcohol or illegal substances.	\$5,000	N/A	N/A	1.00	4	5	4	5	5	3	3	29
8.A.1	Water Summit	Sponsor interagency and public seminars to coordinate efforts to mitigate damage and losses due to drought and develop a drought mitigation plan	\$5,000	\$1,000,000	N/A	1.00	5	4	3	5	3	4	5	29
8.A.2	Water Conservation Standards (CPIP 81)	Develop and adopt countywide water conservation standards, citing USGS precipitation records	None Provided	\$1,000,000	N/A	1.00	5	3	4	4	4	4	5	29
5.A.1	Drainage Reports (CPIP 86)	Require drainage reports for subdivisions and major developments specifying how runoff will be accommodated and environmentally sensitive lands that rely on surface water and groundwater will be protected	None Provided	\$63,700,000	N/A	1.00	3	4	4	4	4	4	5	28
1.A.1	Circulation Design Standards (CPIP 142)	Develop and maintain minimum design standards for new roadways to promote the construction of safe, non-motorized travel facilities	None Provided	N/A	N/A	1.00	5	3	3	3	4	5	5	28
1.B.1	Fire Resistant Building Design (CPIP 97)	Consider adopting ordinances or guidelines to increase the fire resistance of buildings and properties	None Provided	N/A	N/A	1.00	4	4	4	3	4	4	5	28
11.B.1	LEAF Security Fence	Complete security fencing around LEAF (Communications, Sheriff, Police, Jail facility)	\$150,000	N/A	N/A	1.00	3	4	5	3	5	3	5	28
1.A.2	Floodplains and Development Ordinance (CPIP 36)	Amend the zoning ordinance to support creative designs that cluster development away from floodplains and riparian areas.	None Provided	N/A	N/A	1.00	4	4	4	3	4	4	5	28
1.A.3	Wildland/Urban Interface Ordinance (CPIP 13)	Research/consider adopting a fire mitigation and wildland/urban interface ordinance	None Provided	N/A	N/A	1.00	5	4	4	2	4	4	5	28
8.A.3	Water Vendor List	Develop a comprehensive list of water vendors to facilitate developing comprehensive plans for mitigating effects of drought	None Provided	\$1,000,000	N/A	1.00	5	4	4	2	3	5	5	28
11.C.2	Public Safety Information Network	Enhance database information sharing among public safety agencies (to include police, fire, ems, etc.) to provide for intelligence sharing	None Provided	N/A	N/A	1.00	3	3	3	5	4	4	5	27
13.B.2	CIP Safety Planning (CPIP 164)	Prioritize projects that improve the safety of high-accident locations as part of the CIP process	None Provided	N/A	N/A	1.00	5	5	4	3	4	3	3	27



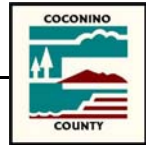
Table 5-5
Summary of Coconino County mitigation actions/projects

ID	Name	Description	Cost	Estimated Losses Due to Hazard	Percent of Hazard Mitigated	B/C Ratio	Social	Technical	Administrative	Political	Legal	Economic	Environmental	TOTAL
2.A.1	Hazard Recognition Education (CPIP 134)	Develop resource materials describing diseases associated with rural environments and life-style—how to recognize potential hazards and symptoms, and how to prevent infection	None Provided	N/A	N/A	1.00	3	4	2	4	5	4	5	27
5.A.2	Floodplain Database & Mapping (CPIP 11)	Identify, develop a database, and map all floodplains, riparian areas, and wetlands to use for site reviews in conjunction with the zoning ordinance and, potentially, with an environmentally sensitive lands ordinance	None Provided	\$63,700,000	N/A	1.00	4	3	4	3	5	3	5	27
1.A.4	Geotechnical Studies (CPIP 102B)	Require a geotechnical study for development proposals that demonstrates the feasibility of building in hazard management zones and describing necessary mitigation techniques	None Provided	N/A	N/A	1.00	4	3	2	3	5	4	5	26
8.A.4	Drought Mitigation Plan (CPIP 73)	Develop a drought mitigation plan	None Provided	\$1,000,000	N/A	1.00	4	3	2	3	5	4	5	26
11.C.3	Public Safety - Utilities Information Network	Develop information sharing networks between public safety, public works, and utilities for protection of critical infrastructure (e.g., utilities, electrical grids, water, pipelines, etc.) to provide for intelligence sharing	None Provided	N/A	N/A	1.00	3	3	3	4	3	4	5	25
6.A.4	Pre-Suppression Fire Plan (CPIP 94)	Develop a coordinated, countywide, pre-suppression fire plan	None Provided	\$2,590,000,000	N/A	1.00	4	3	2	3	4	4	5	25
1.A.5	Property Maintenance Covenants (CPIP 98)	Require covenants for property owners in new forested subdivisions to maintain their property in accordance with applicable stewardship plans, fuels mitigation plans, and the principles of defensible and survivable space	None Provided	N/A	N/A	1.00	3	4	4	1	3	4	5	24
1.B.2	Uniform Fire Code (CPIP 107)	Adopt the Uniform Fire Code and create the position of County Fire Marshall to enforce it.	None Provided	N/A	N/A	1.00	4	5	3	1	4	4	3	24
2.A.2	Evacuation Procedures Education (CPIP 110)	Continue to develop resource materials and educate the public regarding evacuation procedures and individual responsibilities in the event of an emergency	None Provided	N/A	N/A	1.00	2	5	2	4	5	4	2	24
6.E.4	Tree Service Education (CPIP 100)	Develop resource materials describing forestry and tree service consultants who can produce and implement plans for forest stewardship and fuels mitigation.	None Provided	\$2,590,000,000	N/A	1.00	4	5	1	1	4	5	4	24
9.A.1	HazMat Enforcement	Coordinate among law enforcement and transportation departments to increase enforcement of HazMat transportation codes and regulations	None Provided	N/A	N/A	1.00	5	3	2	3	3	3	5	24
13.A.1	Traffic Accident Database (CPIP 166)	Maintain and update a database of accidents that occur on County circulation facilities	None Provided	N/A	N/A	1.00	3	4	1	3	5	4	3	23
6.C.2	Rural Fire Protection Services (CPIP 108)	Research opportunities for establishing fire protection services in areas outside fire districts	None Provided	\$2,590,000,000	N/A	1.00	5	5	1	3	2	3	3	22
1.A.6	Emergency Response LOS (CPIP 112)	Adopt level-of-service standards for emergency response under various development scenarios; develop a means to disclose emergency response conditions for areas that do not meet a level-of-service	None Provided	N/A	N/A	1.00	3	2	1	3	2	3	4	18



Table 5-5
Summary of Coconino County mitigation actions/projects

ID	Name	Description	Cost	Estimated Losses Due to Hazard	Percent of Hazard Mitigated	B/C Ratio	Social	Technical	Administrative	Political	Legal	Economic	Environmental	TOTAL
12.B.1	Seismic Hazard Management Zones (CPIP 102A)	Consider adopting hazard management zones to identify areas that are susceptible to faulting, liquefaction, settlement, and slope instability because of seismic activity	None Provided	N/A	N/A	1.00	3	1	2	2	2	2	5	17
1.B.1	Bark-beetle Removal Ordinance (CPIP 59)	Consider adopting an ordinance and support efforts to require the removal of bark-beetle infested and dead trees to assist with fuels reduction to mitigate wildland fire hazards	None Provided	N/A	N/A	1.00	3	1	1	2	2	2	5	16



5.4 Implementation Strategy

The implementation strategy outlines the “*how, when, and by whom?*” questions related to implementing an identified A/P. The Coconino County planning team developed an implementation strategy for the top 10 ranked projects in Table 5-4, by providing the following information:

- **Lead Agency** – For each A/P, a lead agency was identified. This agency will be responsible for the A/P’s ultimate development and implementation.
- **Funding Source Identification** – Sources of funding for each A/P were identified.
- **Implementation Schedule** – For each A/P, an implementation schedule was developed to specify the anticipated completion dates. For cases in which the A/P completion is tied to the receipt of federal or state grant funds, the dates may be unknown.
- **Critical Interim or Pilot Activities** – Where necessary, information was provided to identify any activities that should be performed or investigated on an interim basis.



DMA2K Citation

Requirement §201.6(c)(3)(iii):

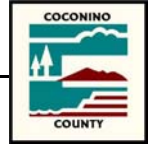
[A mitigation strategy ... section shall include: ...] (iii) An action plan describing how the actions identified in paragraph (c)(2)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

Table 5-6 summarizes the implementation strategy for the county’s ten (10) or less top ranked A/Ps.



Table 5-6
Summary of Coconino County action/project implementation strategies

Mitigation Action/Project		Implementation Strategy			
ID	Name	Lead Agency	Funding Source(s)	Completion Date	Critical Interim or Pilot Activities
6.E.1	Wildfire Public Education Activities	PFAC (Ponderosa Advisory Council)	Local Fire Agencies Federal Grants	ongoing	Education booths / trailer at County Fair, Earth Day activities, etc.
7.A.1	Wood Distribution Network	PFAC (Ponderosa Advisory Council)	Federal Grants	contingent on funding	Free wood offered by Forest Service, Flagstaff Fire Dept, Summit Fire Dept; Public Works delivery of wood to the Reservation
6.A.1	GIS - Fire Data Layers	PFAC (Ponderosa Advisory Council)	Northern Arizona University Federal Grants	contingent on funding	
6.D.1	Neighborhood Wildfire Assessment	PFAC (Ponderosa Advisory Council)	Local Fire Agencies Federal Grants	contingent on funding	
3.A.1	Siren / Alert System	Emergency Services	Federal/State Grants	within 2 years of funding	Sedona Fire District siren alert system in Oak Creek Canyon
6.B.1	Small Diameter Wood Business Recruitment	PFAC (Ponderosa Advisory Council)	Federal/State Grants	contingent on funding	
6.A.2	Fire District Formation	PFAC (Ponderosa Advisory Council)	Fire Districts Coconino County	ongoing	
6.D.2	County Wildland Mapping for State GIS	PFAC (Ponderosa Advisory Council)	US Forest Service Coconino County Northern Arizona University	contingent on funding	
6.A.3	Regional Fuels Crew	PFAC (Ponderosa Advisory Council)	Local Fire Districts Coconino County City of Flagstaff	contingent on funding	Greater Flagstaff area Community Wildfire Protection Plan
6.B.2	Roadside Thinning Project	County Public Works	Coconino County Federal Grants	within 2 years of funding	



SECTION 6: PLAN MAINTENANCE PROCEDURES

According to the DMA2K requirements, each plan must define and document processes or mechanisms for maintaining and updating the hazard mitigation plan within the established five-year planning cycle. Elements of this plan maintenance section include:

- ☑ **Monitoring and Evaluating the Plan**
- ☑ **Updating the Plan**
- ☑ **Implementing the Plan by Incorporation into Other Agency or Jurisdictional Planning Mechanisms**
- ☑ **Continued Public Participation**

Coconino County recognizes that this hazard mitigation plan is intended to be a “living” document with regularly scheduled monitoring, evaluation, and updating.



DMA2K Citation

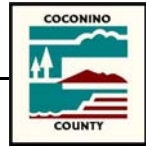
Requirement §201.6(c)(4):

[The plan shall include the following: ...] (4) A plan maintenance process that includes: (i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle. (ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate. (iii) Discussion on how the community will continue public participation in the plan maintenance process.

6.1 Monitoring and Evaluation

Coconino County has established the following monitoring and evaluation procedures:

- **Schedule** – Each plan shall be reviewed on at least an annual basis or following a major disaster. An informal, brief memorandum documenting the review findings shall be prepared and included in Appendix G. Each review shall include an evaluation of the following:
 - **Public Involvement** – Public involvement successes and challenges shall be reviewed and noted, with any recommendations for changes.
 - **Risk Assessment** – The identified hazards and associated risks shall be evaluated with respect to the previous year’s events, and any significant differences shall be noted for possible revision during the next planning cycle.
 - **Mitigation Strategy** – The proposed A/Ps shall be reviewed and updated regarding status and implementation (i.e. – proposed project is now fully



complete). Any changes shall be noted along with the successes and/or challenges associated with the implementation.

A summary of the annual review shall also be presented as an informational item to the County Board of Supervisors on an annual basis.

- **Responsibility** – The responsibility for ensuring that the plan monitoring and evaluation is performed at the scheduled interval shall come under the auspices of the Primary Point of Contact listed in Section 2.

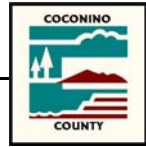
6.2 Plan Update

According to DMA2K, the CCMHMP will require updating and re-approval from FEMA every five years. The plan update will adhere to that set schedule using the following procedure:

- ✓ Six months prior to the plan expiration date, the Coconino County planning team will re-convene to review and assess the materials accumulated in Appendix G.
- ✓ The Coconino County planning team will update and/or revise the appropriate or affected portions of the plan and produce a revised plan document.
- ✓ The revised plan document will be presented before the Coconino County Board of Supervisors for an official concurrence/adoption of the changes.
- ✓ The revised plan will be submitted to FEMA for review, comment and approval.

6.3 Plan Implementation

The CCMHMP will function as a stand alone document subject to its own review and revision schedule presented in Sections 6.1 and 6.2. The CCMHMP will also serve as a reference for other mitigation planning needs of the County. Many of the elements and mitigation strategies presented in this plan will either directly or indirectly impact other planning and mitigation activities within Coconino County. Whenever possible, the County will endeavor to incorporate mitigation actions and projects identified in the CCMHMP into existing County planning mechanisms. At a minimum, the CCMHMP will be reviewed and referenced with any revisions or updates to the planning documents summarized in Table 5-4, as appropriate. This process may include adding or revising building codes, adding or changing zoning and subdivision ordinances, incorporating mitigation goals and strategies into comprehensive plans, and incorporating the risk assessment results into development review processes to ensure proper hazard mitigation for future development.



In addition, an implementation strategy outlining assignments of responsibility and completion schedules for specific actions/projects proposed in this plan are summarized in Table 5-6.

6.4 Continued Public Involvement

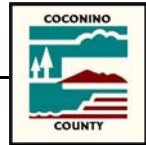
Coconino County is committed to keeping the public informed about the County's hazard mitigation planning efforts, actions and projects. In order to accomplish this, the Coconino County planning team shall pursue the following opportunities for public involvement and dissemination of information whenever possible and appropriate:

- ✓ Provide periodic summary updates of hazard mitigation A/P measures being implemented using local media.
- ✓ Conduct an annual presentation of hazard mitigation planning discoveries, progress, or proposed A/P measures at the Coconino County Board of Supervisors' Meetings.
- ✓ Participate in annual events such as the County fair and other public events.
- ✓ Perform public outreach and mitigation training meetings for targeted populations known to be in higher risk hazard areas (i.e. – floodplain residents).



Appendix A

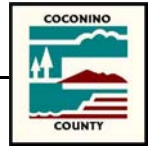
Bibliography



BIBLIOGRAPHY

- ADEM, 2003, *Model Local Hazard Mitigation Plan*, prepared by JE Fuller/Hydrology & Geomorphology, Inc.
- ADEM, 2004 (Draft), *State of Arizona Enhanced Hazard Mitigation Plan*, prepared by URS Corporation.
- Arizona Department of Commerce, 2003, *Profile of Coconino County, Arizona*.
- Arizona Department of Commerce, 2003, *Profile of Flagstaff, Arizona*.
- Arizona Department of Commerce, 2003, *Profile of Fredonia, Arizona*.
- Arizona Department of Commerce, 2003, *Profile of Page, Arizona*.
- Arizona Department of Commerce, 2003, *Profile of Sedona, Arizona*.
- Arizona Department of Commerce, 2003, *Profile of Williams, Arizona*.
- Arizona Department of Transportation, 1994, *Highway Drainage Design Manual, Hydrology*.
- Arizona Department of Transportation, Motor Vehicle Department, 2003, *2003 Motor Vehicle Crash Facts for the State of Arizona*
- Arizona Office of Tourism, 2003, *Arizona Monthly Tourism Indicators, February 2003*.
- Arizona State University, Office of the State Climatologist for Arizona, 2004. Website data from the following URL: <http://geography.asu.edu/azclimate/narrative.htm>
- Brown, D.E., University of Utah, 1999, *Biotic Communities; Southwestern United States and Northwest Mexico*
- Coconino County, 2003, *Coconino County Comprehensive Plan*
- Coconino County, 2005, Coconino County Interactive GIS Mapping Site at the following URL: <http://gis-map.co.coconino.az.us/website/coconino/main.asp>
- Coconino County, 2005, Website URL at: <http://www.co.coconino.az.us/information.asp>
- Desert Research Institute, Western Regional Climate Center, 2004, website data from the following URL: <http://www.wrcc.dri.edu/CLIMATEDATA.html>
- Environmental Working Group, 2004, website data at the following URL: http://www.ewg.org:16080/farm/progdetail.php?fips=04009&progcode=total_dis
- Federal Register, 2002, *Hazard Mitigation Planning and Hazard Mitigation Grant Program; Interim Final Rule*, Volume 67, No. 38, 44 CFR Parts 201 and 206.

COCONINO COUNTY MULTI-HAZARD MITIGATION PLAN



Federal Register, 2002, *Hazard Mitigation Planning and Hazard Mitigation Grant Program; Interim Final Rule*, Volume 67, No. 190, 44 CFR Parts 201 and 206.

FEMA, 2001, *Understanding Your Risks; Identifying Hazards and Estimating Losses*, FEMA 386-2.

FEMA, 2002, *Getting Started; Building Support for Mitigation Planning*, FEMA 386-1.

FEMA, 2002, *Integrating Human-Caused Hazards into Mitigation Planning*, FEMA 386-7.

FEMA, 2002, *State and Local Plan Interim Criteria Under the Disaster Mitigation Act of 2000*.

FEMA, 2003, *Planning for a Sustainable Future*, FEMA 364.

FEMA, 2003, *Developing the Mitigation Plan; Identifying Mitigation Actions and Implementation Strategies*, FEMA 386-3.

FEMA, 2003, *DMA Workshop...Evaluation of Hazard Mitigation Planning*.

FEMA, 2004, web-based information at the following URL:
<http://www.fema.gov/hazards/earthquakes/quake.shtm>

GFFP and PFAC, 2004, *Greater Flagstaff Area Community Wildfire Protection Plan*

Kleindienst, George, 2005, *Draft Greater Williams Area Community Wildfire Protection Plan*

National Fire Protection Association, 2000, *Standard on Disaster/Emergency Management and Business Continuity Programs*, NFPA 1600.

National Response Center, 2004, website data at the following URL:
<http://www.nrc.uscg.mil/foia.html>

National Weather Service, 2005, website posting at the following NWS URL:
<http://www.wrh.noaa.gov/fgz/safety/criteria.php?wfo=fgz>

Tusayan Community Wildfire Protection Committee, 2005, *Tusayan Community Wildfire Protection Plan*

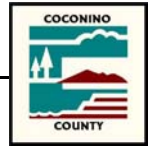
URS, 2004, *State of Arizona Hazard Mitigation Plan – Interim Draft – Community Profiles and Hazard Identification/Profiles*.

U.S. Army Corps of Engineers, Los Angeles District, 1994, *Flood Damage Report – State of Arizona – Floods of 1993*

U.S. Department of Agriculture, Arizona Agricultural Statistics Service, 2004, *2002 Annual Statistics Bulletin*, as posted at the following URL: <http://www.nass.usda.gov/az/02bul/main.htm>

U.S. Department of Agriculture, 2004, *News Release No. fs0199.04*, website data at the following URL: <http://www.usda.gov/Newsroom/fs0199.04.html>

COCONINO COUNTY MULTI-HAZARD MITIGATION PLAN



U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, 2004, Storm Events Database.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center, 1998, *United States Snow Climatology*, TD-9641

U.S. Department of Homeland Security, Federal Emergency Management Agency, HAZUS®-MH, build 31.

Webster, 1981, *Webster's New Collegiate Dictionary*, G. & C. Merriam Company, Springfield, MA.



Appendix B

Arizona Department of Commerce 2003 Community Profiles



Appendix C

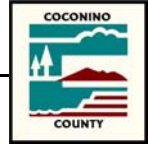
Public Involvement Records



Appendix D

Glossary of Terms





GLOSSARY OF TERMS

GENERAL TERMS

Asset

Any natural or human-caused feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.

Building

A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

Critical Facilities and Infrastructure

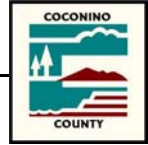
Systems or facilities whose incapacity or destruction would have a debilitating impact on the defense or economic security of the nation. The Critical Infrastructure Assurance Office (CIAO) defines eight categories of critical infrastructure, as follows:

1. **Telecommunications infrastructure:** Telephone, data services, and Internet communications, which have become essential to continuity of business, industry, government, and military operations.
2. **Electrical power systems:** Generation stations and transmission and distribution networks that create and supply electricity to end-users.
3. **Gas and oil facilities:** Production and holding facilities for natural gas, crude and refined petroleum, and petroleum-derived fuels, as well as the refining and processing facilities for these fuels.
4. **Banking and finance institutions:** Banks, financial service companies, payment systems, investment companies, and securities/commodities exchanges.
5. **Transportation networks:** Highways, railroads, ports and inland waterways, pipelines, and airports and airways that facilitate the efficient movement of goods and people.
6. **Water supply systems:** Sources of water; reservoirs and holding facilities; aqueducts and other transport systems; filtration, cleaning, and treatment systems; pipelines; cooling systems; and other delivery mechanisms that provide for domestic and industrial applications, including systems for dealing with water runoff, wastewater, and firefighting.
7. **Government services:** Capabilities at the federal, state, and local levels of government required to meet the needs for essential services to the public.
8. **Emergency services:** Medical, police, fire, and rescue systems.

Department of Homeland Security (DHS)

Following the September 11, 2001 terrorist attacks, President George W. Bush created a new federal government department in order to bring 22 previously separate domestic agencies together. The new department's first priority is protecting the nation against further terrorist attacks. Component agencies analyze threats and intelligence, guard borders and airports, protect critical infrastructure,





and coordinate the response for future emergencies. The new department is organized into five major directorates: Border and Transportation Security (BTS); Emergency Preparedness and Response (EPR); Science and Technology (S&T); and Information Analysis and Infrastructure Protection (IAIP); Management. In addition, several other critical agencies have been folded into the new department or are newly created. The Federal Emergency Management Agency (FEMA) is the foundation of the Emergency Preparedness and Response (EPR) Directorate.

Disaster Mitigation Act of 2000 (DMA2K)

A law signed by the President on October 30, 2000 that encourages and rewards local and state pre-disaster planning, promotes sustainability as a strategy for disaster resistance, and is intended to integrate state and local planning with the aim of strengthening statewide mitigation planning.

Emergency Preparedness and Response (EPR) Directorate

One of five major Department of Homeland Security Directorates which builds upon the formerly independent Federal Emergency Management Agency (FEMA). EPR is responsible for preparing for natural and human-caused disasters through a comprehensive, risk-based emergency management program of preparedness, prevention, response, and recovery. This work incorporates the concept of disaster-resistant communities, including providing federal support for local governments that promote structures and communities that reduce the chances of being hit by disasters.

Emergency Response Plan

A document that contains information on the actions that may be taken by a governmental jurisdiction to protect people and property before, during, and after a disaster.

Federal Emergency Management Agency (FEMA)

Formerly independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery. As of March 2003, FEMA is a part of the Department of Homeland Security's Emergency Preparedness and Response (EPR) Directorate.

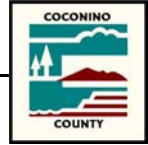
Flood Insurance Rate Map (FIRM)

Map of a community, prepared by FEMA, that shows the special flood hazard areas and the risk premium zones applicable to the community.

Frequency

A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.





Fujita Scale of Tornado Intensity

Rates tornadoes with numeric values from F0 to F5 based on tornado winds speed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while an F5 indicates severe damage sustained.

Geographic Information Systems (GIS)

A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.

Hazard

A source of potential danger or adverse condition. Hazards include both natural and human-caused events. A natural event is a hazard when it has the potential to harm people or property and may include events such as floods, earthquakes, tornadoes, tsunamis, coastal storms, landslides, and wildfires that strike populated areas. Human-caused hazard events originate from human activity and may include technological hazards and terrorism. Technological hazards arise from human activities and are assumed to be accidental and/or have unintended consequences (e.g., manufacture, storage and use of hazardous materials). While no single definition of terrorism exists, the Code of Federal Regulations defines terrorism as "...unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives."

Hazard Event

A specific occurrence of a particular type of hazard.

Hazard Identification

The process of identifying hazards that threaten an area.

Hazard Mitigation

Cost effective measures taken to reduce or eliminate long-term risk associated with hazards and their effects.

Hazard Profile

A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent.

HAZUS

A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA.

Mitigate

To cause to become less harsh or hostile; to make less severe or painful. Mitigation activities are actions taken to eliminate or reduce the probability of the event, or reduce its severity of consequences, either prior to or following a disaster/emergency.

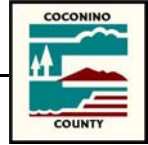
Mitigation Plan

A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in a defined geographic area, including a description of actions to minimize future vulnerability to hazards.

Modified Mercalli Intensity Scale

The Modified Mercalli Intensity Scale is commonly used in the United States by seismologists seeking information on the severity of earthquake effects. Intensity ratings are expressed as Roman numerals between I at the low end and XII at the high end. The Intensity Scale differs from the Richter Magnitude Scale in that the effects of any one earthquake vary greatly from place to place, so there may be many Intensity values (e.g.: IV, VII) measured from one earthquake. Each earthquake,





on the other hand, should have just one Magnitude, although the several methods of estimating it will yield slightly different values (e.g.: 6.1, 6.3).

100-Hundred Year Floodplain

Also referred to as the Base Flood Elevation (BFE) and Special Flood Hazard Area (SFHA). An area within a floodplain having a 1 percent or greater chance of flood occurrence in any given year.

Planning

The act or process of making or carrying out plans; the establishment of goals, policies, and procedures for a social or economic unit.

Probability

A statistical measure of the likelihood that a hazard event will occur.

Promulgation

To make public and put into action the Hazard Mitigation Plan via formal adoption and/or approval by the governing body of the respective community or jurisdiction (i.e. – Town or City Council, County Board of Directors, etc.).

Q3 Data

The Q3 Flood Data product is a digital representation of certain features of FEMA's Flood Insurance Rate Map (FIRM) product, intended for use with desktop mapping and Geographic Information Systems technology. The digital Q3 Flood Data are created by scanning the effective Flood Insurance Rate Map (FIRM) paper maps and digitizing selected features and lines. The digital Q3 Flood Data are designed to serve FEMA's needs for disaster response activities, National Flood Insurance Program activities, risk assessment, and floodplain management.

Repetitive Loss Property

A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least \$1000 each have been paid within any 10-year period since 1978.

Richter Magnitude Scale

A logarithmic scale devised by seismologist C.F. Richter in 1935 to express the total amount of energy released by an earthquake. While the scale has no upper limit, values are typically between 1 and 9, and each increase of 1 represents a 32-fold increase in released energy.

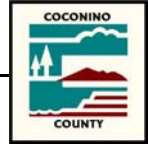
Risk

The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage beyond a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Substantial Damage

Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage.





Vulnerability

Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power—if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Vulnerability Analysis

The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability analysis should address impacts of hazard events on the existing and future built environment.

Vulnerable Populations

Any segment of the population that is more vulnerable to the effects of hazards because of things such as lack of mobility, sensitivity to environmental factors, or physical abilities. These populations can include, but are not limited to, senior citizens and school children.

Goals

General guidelines that explain what you want to achieve. Goals are usually broad statements with long-term perspective.

Objectives

Defined strategies or implementation steps intended to attain the identified goals. Objectives are specific, measurable, and have a defined time horizon.

Actions/Projects

Specific actions or projects that help achieve goals and objectives.

Implementation Strategy

A comprehensive strategy that describes how the mitigation actions will be implemented.

NATURAL HAZARDS

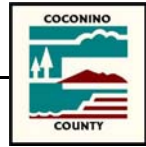
Avalanche

Avalanches are massive downward and outward movements of slope-forming materials. These masses may range from car-size to entire mountainsides and includes movement of snow, ice, and debris moving rapidly enough to threaten life. Snow avalanches are caused by the added weight of fresh snow or by gradual weakening of older snow and are often triggered by recreational activity or the impact of small masses of snow or ice falling from above. Three main factors determine whether avalanches are likely to occur - the weather, snow pack, and terrain. There are two principal types of avalanches: a loose snow avalanche gathers more and more snow as it descends a mountainside; a slab avalanche consists of more compact, cohesive snow and ice that breaks away from the slope in a discrete mass. The latter type is responsible for the great majority of accidents.

Drought

A drought occurs when water supplies cannot meet established demands. "Severe" to "extreme" drought conditions endanger livestock and crops, significantly reduce surface and ground water supplies, increase the potential risk for wildland fires, increase the potential for dust storms, and cause significant economic loss. Humid areas are more vulnerable than arid areas. Drought may not be





constant or predictable and does not begin or end on any schedule. Short term droughts are less common due to the reliance on irrigation water in arid environments.

Dust / Sand Storms

A dust or sand storm is a severe windstorm that sweeps clouds of dust across an arid region. They can be hazardous to transportation and navigation and to human health. Severe or prolonged dust and sand storms can result in disasters causing extensive economic damage over a wide area and personal injury and death. In Arizona, dust or sand storms are generally associated with the advance of a thunderstorm.

Earthquake

An earthquake is a naturally-induced shaking of the ground, caused by the fracture and sliding of rock within the Earth's crust. The magnitude is determined by the dimensions of the rupturing fracture (fault) and the amount of displacement that takes place. The larger the fault surface and displacement, the greater the energy. In addition to deforming the rock near the fault, this energy produces the shaking and a variety of seismic waves that radiate throughout the Earth. Earthquake magnitude is measured using the Richter Scale and earthquake intensity is measured using the Modified Mercalli Intensity Scale.

Extreme Cold

Extreme cold is associated with either polar regions or extreme winter storms. Communities in polar regions are less threatened as they are normally prepared to cope with extreme cold. The extreme cold associated with winter storms is a deceptive killer as it indirectly causes injury and death resulting from exhaustion and overexertion, hypothermia and frostbite from wind chill, and asphyxiation.

Extreme Heat

Extreme heat is defined as temperatures that hover ten degrees or more above the average high temperature for the region and last for several weeks. Humid conditions may also add to the discomfort of high temperatures. Excessively dry and hot conditions can provoke dust storms and low visibility.

Flooding / Flash Flooding

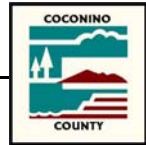
Flooding is an overflowing of water onto normally dry land and is one of the most significant and costly of natural disasters. Flooding tends to occur in Arizona during anomalous years of prolonged, regional rainfall (typical of an El Nino year), and is typified by increased humidity and high summer temperatures.

Flash flooding is caused by too much rain falling in a small area in a short time and are a critical natural hazard in Arizona, often a result of summer monsoon thunderstorms or the remnants of a tropical storm. Several factors contribute to flash flooding: rainfall intensity and duration, topography, soil conditions, and ground cover. Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area and can occur within a few minutes or hours of excessive rainfall, or a quick release from a dam or levee failure. Thunderstorms produce flash flooding, often far from the actual storm and at night when natural warnings may not be noticed.

Infestations

An infestation consists of an invasion or spreading of a living organism (plant, animal, etc.) that has an adverse (unwanted) effect on the population or the environment. The effect may range from a simple nuisance to an infectious disease or destructive parasite or insect. Infestations may result from non-indigenous plants, rodents, weeds, parasites, insects, and fungi, and may adversely affect people, animals, agriculture, economy (e.g., tourism), and property.





Liquefaction

The phenomenon that occurs when ground shaking (earthquake) causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.

Landslides / Mudslides

Landslides, like avalanches are massive downward and outward movements of slope-forming materials. The term landslide is restricted to movement of rock and soil and includes a broad range of velocities. Slow movements, although rarely a threat to life, can destroy buildings or break buried utility lines. A landslide occurs when a portion of a hill slope becomes too weak to support its own weight. The weakness is generally initiated when rainfall or some other source of water increases the water content of the slope, reducing the shear strength of the materials. A mud slide is a type of landslide referred to as a flow. Flows are landslides that behave like fluids: mud flows involve wet mud and debris.

Monsoon

A monsoon is any wind that reverses its direction seasonally. In the Southwestern U.S., for most of the year the winds blow from the west/northwest. Arizona is located on the fringe of the Mexican Monsoon which during the summer months turns the winds to a more south/southeast direction and brings moisture from the Pacific Ocean, Gulf of California, and Gulf of Mexico. This moisture often leads to thunderstorms in the higher mountains and Mogollon Rim, with air cooled from these storms often moving from the high country to the deserts, leading to further thunderstorm activity in the desert. A common misuse of the term monsoon is to refer to individual thunderstorms as monsoons.

Radon

Radon is a naturally occurring radioactive gas that is odorless and tasteless. It is formed from the radioactive decay of uranium. Uranium is found in small amounts in most rocks and soil. It slowly breaks down to other products such as radium, which breaks down to radon. Radon also undergoes radioactive decay. Radon enters the environment from the soil, from uranium and phosphate mines, and from coal combustion. Radon has a radioactive half-life of about 4 days; this means the one-half of a given amount of radon will decay to other products every 4 days. Some of the radon produced in the soil will move to the surface and enter the air. Radon also moves from the soil and enters the groundwater.

Subsidence

Land subsidence occurs when large amounts of ground water have been withdrawn from certain types of rocks, such as fine-grained sediments. The rock compacts because the water is partly responsible for holding the ground up. When the water is withdrawn, the rocks fall in on itself.

Thunderstorms / High Winds

Thunderstorms are characterized as violent storms that typically are associated with high winds, dust storms, heavy rainfall, hail, lightning strikes, and/or tornadoes. The unpredictability of thunderstorms, particularly their formation and the rapid movement to new locations heightens the possibility of floods. Thunderstorms, dust/sand storms and the like are most prevalent in Arizona during the monsoon season, which is a seasonal shift in the winds that causes an increase in humidity capable of fueling thunderstorms. The monsoon season in Arizona typically is from late-June or early-July through mid-September.

Tornadoes / Dust Devils

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds in excess of 250 mph.





Damage paths can exceed a mile wide and 50 miles long. Tornadoes are one of nature's most violent storms. In an average year, 800 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. The damage from tornadoes is due to high winds. The Fujita Scale of Tornado Intensity measures tornado / high wind intensity and damage.

A dust devil is a small but rapidly rotating column of wind made visible by the dust, sand, and debris it picks up from the surface. They typically develop best on clear, dry, hot afternoons and are common during the summer months in the desert portions of Arizona. While resembling tornadoes, dust devils typically do not produce damage, although in Arizona they have done so occasionally.

Tropical Storms / Hurricane

A tropical system in which the maximum sustained surface wind ranges from 34 to 63 knots (39 to 73 mph). Tropical storms are associated with heavy rain, high wind, and thunderstorms. High intensity rainfall in short periods is typical.

A tropical storm is classified as a hurricane when its sustained winds reach or exceed 74 mph (64 knots). These storms are medium to large in size and are capable of producing dangerous winds, torrential rains, and flooding, all of which may result in tremendous property damage and loss of life, primarily in coastal populated areas. The effects are typically most dangerous before a hurricane makes landfall, when most damage occurs. However, Arizona has experienced a number of tropical storms that caused extensive flooding and wind damage.

Volcanoes

A volcano is a vent in the Earth from which molten rock (magma) and gas erupt. The molten rock that erupts from the volcano (lava) forms a hill or mountain around the vent. The lava may flow out as a viscous liquid, or it may explode from the vent as solid or liquid particles. Volcanic eruptions can be placed into two general categories: those that are explosive and those that are effusive resulting in gently flowing lava flows, spatter cones, and lava fountains. Many eruptions are highly explosive in nature. They produce fragmental rocks from erupting lava and surrounding area rock and may produce fine volcanic ash that rises many kilometers into the atmosphere in enormous eruption columns. Explosive activity can also cause widespread ash fall, pyroclastic flows, debris avalanches, landslides, pyroclastic surges, and lahars.

Wildfires

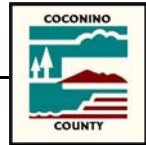
Wildfire is a rapid, persistent chemical reaction that releases heat and light, especially the exothermic combination of a combustible substance with oxygen. Wildfires present a significant potential for disaster in the southwest, a region of relatively high temperatures, low humidity, low precipitation, and during the spring moderately strong daytime winds. Combine these severe burning conditions with people or lightning and the stage is set for the occurrence of large, destructive wildfires.

Winter Storms

Winter storm is defined as a cold wind accompanied by blowing snow; freezing rain or sleet, cold temperatures, and possibly low visibility and drifting snow. The storms often make roads impassable. Residents, travelers, and livestock may become isolated or stranded without adequate food, water, and fuel supplies. The conditions may overwhelm the capabilities of a local jurisdiction. Winter storms are considered deceptive killers as they indirectly cause transportation accidents, and injury and death resulting from exhaustion/exertion, hypothermia and frostbite from wind chill, and asphyxiation.

HUMAN-CAUSED HAZARDS





Arson

The act of willfully and maliciously burning of property, especially with criminal or fraudulent intent.

Biological Hazards

A hazard caused by the presence of any micro-organism, virus, infectious substance, or biological product that may be engineered as a result of biotechnology or any naturally occurring micro-organism, virus, infectious substance, or biological product, capable of causing death, disease, or other biological malfunction.

Building / Structure Collapse

The failure and downfall of a structure. The collapse may result from a variety of natural causes such as hurricanes, earthquakes, tornadoes, floods, or from manmade circumstances such as construction deficiencies, neglect, aging infrastructure, or acts of terrorism.

Civil Disobedience

The refusal to obey civil laws or decrees, usually taking the form of passive resistance. People practicing civil disobedience break a law because they consider the law unjust, want to call attention to its justice, and hope to bring about its repeal or amendment. They are also willing to accept a penalty for breaking the law.

Civil Disturbance

When individuals or segments of the population create a situation, often a result of civil unrest, requiring a response from the emergency response community to protect lives and property. The disturbance may be small and isolated to a small area or be of a larger scale and exceeding the response capabilities of a jurisdiction. Activities are normally active (demonstrations, looting, riots) rather than passive (public speeches, sit-downs, marches).

Civil Unrest

When a segment of the civil population indicates its discontent or dissatisfaction with existing political, social, or religious issues. The unrest may materialize as a civil disturbance or civil disobedience. Activities may be passive (public speeches, sit-downs, marches) or active (demonstrations, looting, riots).

Dam / Levee Failure

Dam/levee failure can be caused by natural occurrences such as floods, rock slides, earthquakes, or the deterioration of the foundation or the materials used in construction. Usually the changes are slow and not readily discovered by visual examination. Such a failure presents a significant potential for a disaster in that significant loss of life and property would be expected in addition to the possible loss of power and water resources.





Enemy Attack

The use of aggressive action against an opponent in pursuit of an objective. An "enemy attack" is considered an attack of one sovereign government against another as either a declared or undeclared act of war.

Explosion/Fire

An explosion is the sudden loud release of energy and a rapidly expanding volume of gas that occurs when a gas explodes or a bomb detonates. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials/chemicals, dust, and bombs. While an explosion surely may cause death, injury and property damage, a fire routinely follows which may cause further damage and inhibit emergency response.

Extreme Air Pollution

Pollution is the contamination of the earth's environment with materials that interfere with human health, the quality of life, or the natural functioning of ecosystems. Air pollution is the addition of harmful substances to the atmosphere. It makes people sick, causing breathing problems and sometimes cancer, and it harms plants, animals, and the ecosystems in which they live. Some pollutants return to earth in the form of acid rain and snow that corrodes structures, damages vegetation, and makes streams and lakes unsuitable for life. "Extreme air pollution" exceeds established thresholds resulting in the need to take corrective actions and cause the public to take precautions.

Fuel / Resource Shortage

A fuel/resource shortage is defined as an actual or potential shortage of natural gas, crude and refined petroleum, petroleum-derived fuels, or other critical commodities that significantly impacts the ability to: render essential government and emergency services (medical, fire, safety); and threatens the health and safety of the public.

Hazardous Materials Incidents

A spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment of a hazardous material, but excludes: (1) any release which results in exposure to poisons solely within the workplace, with respect to claims which such persons may assert against the employer of such persons; (2) emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine; (3) release of source, byproduct, or special nuclear material from a nuclear incident; and (4) the normal application of fertilizer.

Hostage Situation

A situation in which people are held hostage and negotiations take place for their release. The situation may range from a simple domestic or isolated criminal act to an attempt to impose will on a national or international scale to intimidate or coerce a government to further a political, social, or religious objective.

Hysteria (Mass)

Also known as "mass psychogenic illness" and "hysterical contagion," mass hysteria is a situation in which a symptom or set of symptoms for which there is no physical explanation spreads quickly among a group. It may occur as a reaction to an incident of domestic terrorism.

Power / Utility Failure

A power/utility failure is defined as an actual or potential shortage of electric power or the interruption of electrical power that significantly threatens health and safety. Many communities are vulnerable to many localized, short and long-term energy emergencies. Power shortages or failures do



occur and may be brought on by severe weather conditions, such as blizzards, ice storms, extreme heat, thunderstorms, or events such as war, or civil disturbance.

Radiological Accident

A radiological accident is a release of radioactive materials. It can occur where radioactive materials are used, stored, or transported. Potentially nuclear power plants (fixed nuclear facilities), hospitals, universities, research laboratories, industries, major highways, railroads, or shipping yards could be the site of a radiological accident.

Sabotage

Sabotage is the deliberate destruction of property, dismantling of technology or other interference or obstruction of normal operations. "Sabotage" is normally considered an act related to war; similar acts during "non-war" conditions would be considered a terrorist act.

Special Events

An event of such a magnitude, media visibility, or importance that may require extraordinary preparations by government and possible response by emergency response agencies. Such events may be considered an opportunity or target for activist or terrorist activities.

Strike

A strike is an organized work stoppage carried out by a group of employees for the purpose either of enforcing demands relating to employment conditions on their employer or of protesting unfair labor practices. A strike may be engaged to obtain improvement in work conditions, higher wages or shorter hours, to forestall an adverse change in conditions of employment, or to prevent the employer from carrying out actions viewed by workers as detrimental to their interests.

Transportation Accident

A transportation accident is an incident related to a mode of transportation (highway, air, rail, waterway, port, harbor) where an emergency response is necessary to protect life and property.

Terrorism (Economic, Cyber, Nuclear, Biological, and Chemical)

"Terrorism is the unlawful use of force or violence, or threatened use of force or violence, against persons and places for the purpose of intimidation and/or coercing a government, its citizens, or any segment thereof for political or social goals." (Department of Justice, Federal Bureau of Investigation).

Terrorism can include computer-based (cyber) attacks and the use of weapons of mass destruction (WMD) to include chemical, biological, radiological, nuclear, or explosive (CBRNE) agents.



Appendix E

Miscellaneous Report Excerpts
and
State of Arizona Hazard Profiles



Appendix F

Detailed Historic Hazard Records



Appendix G

Plan Maintenance Review Memorandums

